

Pit and Quarry

SAND - GRAVEL - STONE
CEMENT - LIME - GYPSUM

Direct and To The Point

is transportation by American Steel & Wire Company's
Trenton-Bleichert System AERIAL TRAMWAY

Vol 11, Oct 1925 - Mar 1926

Aerial Tramways are not new in principle—but recent improvements in construction and operation are bringing their advantages into greater prominence.

The Trenton-Bleichert System of Aerial Tramways represents the most effective and up-to-date form of Aerial Tramway construction. A striking example of their highly practical use is shown in the Vermont Marble Company's installation at Proctor, Vermont.* This Company is transporting 350 tons of sand and gravel daily over a 2 miles long Trenton-Bleichert Aerial Tramway installed by the American Steel and Wire Co.

Transportation by Aerial-Tramway shows the way to large savings in hauling costs over the slower and less certain method of highway transportation.

You will find our book on Aerial Tramways both interesting and instructive. Let us send you one.

Illustrated Catalog Free. Engineering Service.

**This installation fully described in this number.*



AMERICAN STEEL & WIRE COMPANY
CHICAGO NEW YORK

October 1, 1925

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Circulation 7,600



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TN

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P67

v. 11 "It cant be beat!"

ASK THE OPERATOR-HE KNOWS

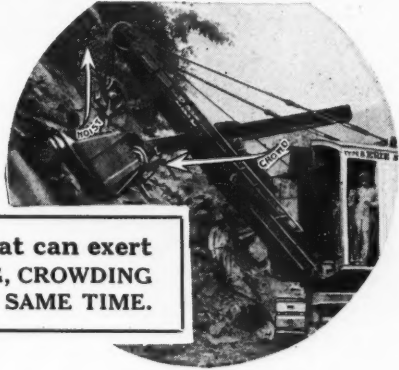


INDUSTRIAL'S
CRAWLING TRACTOR CRANES

INDUSTRIAL WORKS • • • BAY CITY • MICHIGAN

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Load More Rock every day



With the ERIE— the shovel that can exert THE FULL POWER OF ITS HOISTING, CROWDING AND SWINGING ENGINES AT THE SAME TIME.

When the dipper tugs at a stubborn ledge of rock, the operator leaves the ERIE's hoisting throttle wide open— full steam on the hoisting pull—

While he works the crowding lever back and forth, prying the rock loose by moving the dipper in and out while pulling up, *and also swings the shovel slightly from right to left, to pry sideways.*

It is easy to see how much the ERIE's digging power would be cut down if the "crowd" and "swing" were driven (through friction clutches) by the same engine that was *already forced beyond its maximum load* to meet the demands of the hoisting pull.

Most quarrymen want to have plenty of *speed* on tap for rush orders. That's one reason why you see far more ERIES than any other shovel in the 20-ton class.

ERIE STEAM SHOVEL CO. Erie, Pa., U. S. A.

Builders of ERIE Shovels, Cranes, Ditchers, Draglines, Trench Hoes, etc.

Branch Offices:
Boston New York
Philadelphia
Atlanta Pittsburg
Chicago

Representatives
throughout the U. S. A.

ERIE

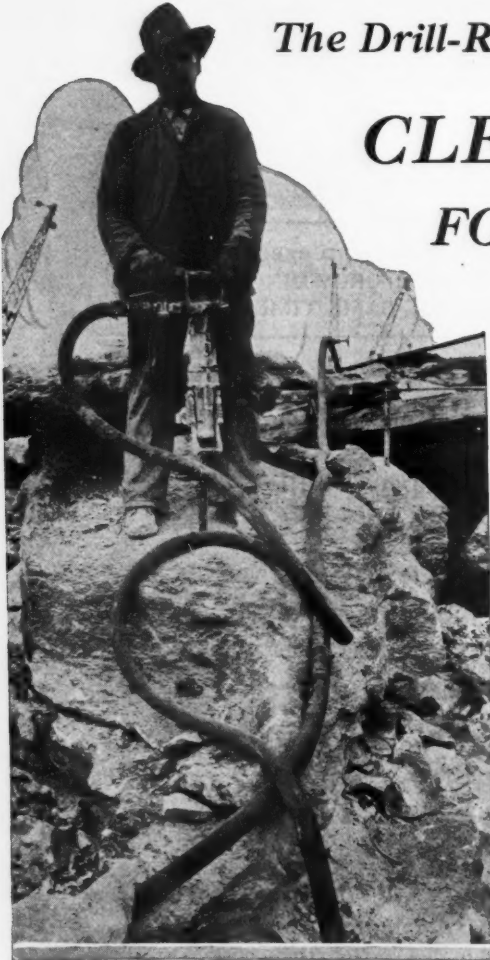
Revolving
Shovels

The reliable ERIE is your best insurance against lost time

Breakdowns are almost unknown with an ERIE—the most highly developed power shovel ever built. (Far more ERIES in service than any other shovel of one size and type.)

Actual records, kept by hundreds of owners, show that ERIES cost only $\frac{1}{3}$ as much for upkeep and MAKE A CORRESPONDING SAVING IN WORKING TIME.

Even in the hardest rock excavation, the ERIE'S dipper teeth get the full power of the engines without a smashing jar. No need to bang into a rock in order to hold fly-wheel momentum—the steam's expansive force comes smoothly, giving the dipper a valuable "cushion" against sudden shocks. Protects the entire mechanism.



The Drill-Runner's Delight—

CLEVELAND FORTY-FOUR!

Pleases the drill-runner because it holds so easy, and because it helps him to do a bigger day's work with less exertion. The Forty-Four cuts SO FAST,—and it always stays on the job!

Let us tell you more about this good rock eater. Write for Bulletin 49.

The Cleveland Rock Drill Co.

CHICAGO, ILL.
605 S. Dearborn St.
NEW YORK CITY
30 Church St.
NEGAUNEE, MICH.
222 Heath St.

DETROIT, MICH.
428 Insurance
Exchange Bldg.
ST. LOUIS, MO.
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Exchange Bldg.

PHILADELPHIA, PA.
The Bourse Bldg.

BIRMINGHAM, ALA.
403 N. 24th St.
Box 2028

3734 East 78th Street,
CLEVELAND, OHIO
BOSTON, MASS.
113 Pearl St.

PITTSBURGH, PA.
922 Farmers
Bank Bldg.

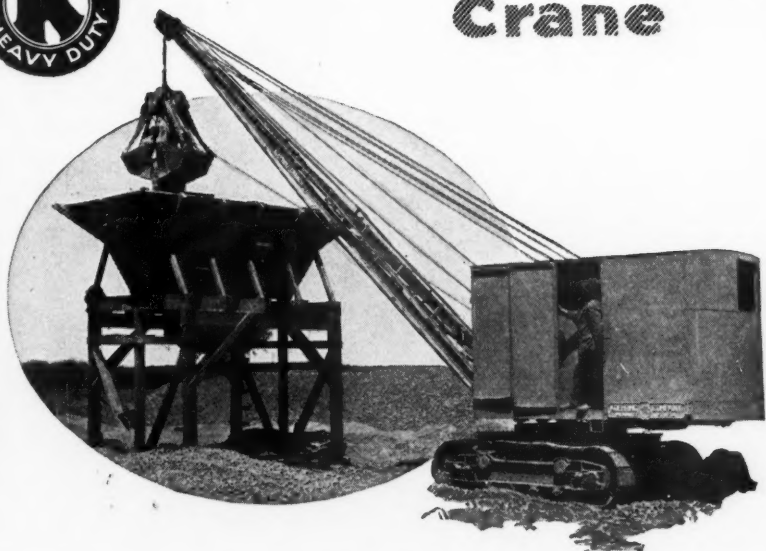
Canadian Trade Supplied by The Cleveland Pneumatic Tool Co. of Canada, Ltd., Toronto, Ontario.
British Representatives, John McDonald & Co., Pollokshaws, Glasgow, Scotland.

Ask Your Own Supply House for Cleveland Drills.

CLEVELAND ROCK DRILLS

KOEHRING

Crane



Easy Control Means Speedy Action! Capacity!

THE operator handles the Koehring Crane with his fingers— not with his weight! He can shift the levers with light pressure! Pedals are as easy! Double outside-band friction clutches make control easy. Operator maintains top capacity every minute of the day. Besides, easy control gives zip and speed to every function.

Booming and hoisting may be combined in one operation instead of two stop-and-go operations. The Koehring is designed for it. No excessive wear!

Koehring heavy duty construction is the soundest value you can buy in a crane. It is the distinctive value in the crane field.

Write for Crane Bulletin CE 32

KOEHRING COMPANY

PAVERS--MIXERS--GASOLINE CRANES, DRAGLINES AND SHOVELS
MILWAUKEE, WISCONSIN

Sales Offices and Service Warehouses in all principal cities

Foreign Department—Room 1370, 50 Church St., New York

*Canada—Koehring Company of Canada, Ltd.,
105 Front Street, East, Toronto, Ontario.*

Mexico—F. S. Lapum, Cinco De Mayo 21, Mexico, D. F

Crane Capacities

No. 1— $\frac{3}{4}$ cu. yd. clamshell bucket on 40 ft. boom, standard.

Lifting capacity, 10 tons at 12 ft. radius.

4 cylinder, 5 in. by 6 in. gasoline engine, 1000 R. P. M.

No. 2—1 cu. yd. clamshell bucket on 45 ft. boom, standard.

Lifting capacity, 15 tons at 12 ft. radius.

4 cylinder, 5 $\frac{1}{2}$ in. x 7 in. gasoline engine, 1000 R. P. M.

A 2324-III-IV

The New
BUCYRUS
120 B
-4YARD-
REVOLVING
SHOVEL



Built for
THE HEAVIEST DIGGING
in Mine and Quarry

Mine and quarry operators have long wanted a mobile, powerful, full-revolving shovel, designed especially for their heaviest work. They need a big-output shovel with the big dipper capacity and strength of the railroad type, the mobility of the small revolving shovel, and a working range greater than either.

That is what the new Bucyrus 120-B 4 Yard Shovel provides

No one, not even Bucyrus, has ever built a shovel like this before. It is not a stripper. It is not for easy digging. It is not convertible for dragline work.

This Bucyrus is only for those who dig ore or rock and want to handle it with a four yard dipper, as fast as steam or electricity will permit.

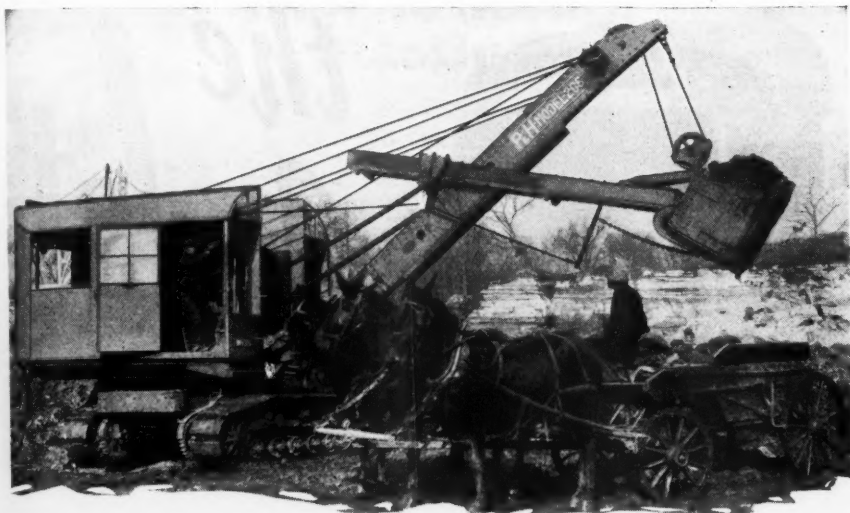
It is so far beyond anything ever built before that it is hard to describe.

So far as words, paper and ink would let us, we have put the facts about the 120-B into our new bulletin D-1202-A, now being printed. Shall we send you a copy?

BUCYRUS COMPANY
 South Milwaukee Wisconsin

BUCYRUS

New York Chicago Birmingham San Francisco Pittsburgh Tokyo London



Easy and Fast Quarry Stripping

THE Independence Quarry Co. operate a very complete and efficient quarry near Kansas City. Rock is supplied for the operations of the well-known Ross Construction Co. of that city, the surplus being used for the outside market. The work of stripping the top soil has been left to a Model 206 P & H Gasoline Shovel pictured here.

Fast and mobile, the powerful crowding motion of the P & H is exerted throughout the dipper movement. The new power clutch control provides utmost ease in handling—the control is almost push-button easy.

These important factors along with the sturdy construction and low maintenance of P & H have been directly responsible for big yardage, steady daily operation and real economy.

P & H can help you make an easy and quick job of your quarry stripping or similar excavation work—a profitable worker wherever used. Bulletin 82-X gives all details. Write for a copy.

HARNISCHFEGER CORPORATION

Successor to

PAWLING & HARNISCHFEGER CO.

Established in 1884

3851 National Avenue, Milwaukee, Wis.

New York	Birmingham	Kansas City	Pittsburgh	Seattle
Dallas	San Francisco	Detroit	Memphis	Portland
Philadelphia	Chicago	Minneapolis	Los Angeles	Jacksonville

Warehouses and Service Stations:

New York Memphis Jacksonville San Francisco Los Angeles Seattle

P & H

GASOLINE SHOVEL



the
best

AMSCO Missabe Dipper with Vanderhoef Front

That's what all Users say of—

Amsco Missabe Dippers equipped with the Vanderhoef Front. They have put this sturdy dipper to tests of the toughest nature and they have always found it worthy.

The United Verde Copper Co., Jerome, Arizona, are using two shovels equipped with 4-yard Amsco Missabe Dippers and one shovel equipped with an 8-yard Amsco Missabe Dipper—both dippers have Vanderhoef Fronts.

A Few Reasons Why

1. Made throughout of Manganese Steel.
2. Teeth Bases are cast integrally with front.
3. Interchangeable and reversible points.
4. Operates under less power—loads and unloads with ease.
5. Smooth inside front eliminates clogging.
6. Uniform metal sections equalize strains from socket casting to lip.
7. General scientific construction and long wearing qualities make for higher efficiency.

In a letter to his General Manager at Clarkdale, Arizona, the Supt. of Shovel Operations, writes of Missabe-Vanderhoef Dippers as follows:

"Personally I consider this the best equipment on the market as the fronts are built to stand long wear and heavy strains and the width of the tooth being comparatively thin at the base . . . permits easy filling of the bucket.

I have talked with numerous shovel operators . . . and they are all agreed that this is the best equipment obtainable."

It's not at all unusual that Missabe-Vanderhoef dippers should be classed as "best." Read the "Reasons Why" and write for prices and literature.

AMERICAN MANGANESE STEEL CO.

General Offices: 388 E. Fourteenth St., Chicago Heights, Ill.

Foundries: Chicago Heights, Ill.; New Castle, Del.; Oakland, Cal.; Los Angeles, Cal.; Denver, Colo. Southern Manganese Steel Co., St. Louis, Mo.

AMSCO

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Spok
Sprin

Du F
Atlan

P C

How to Secure Better Blasting Results

THE solution of blasting problems can be accomplished by adopting the methods proposed by the explosives experts composing the technical field staff of the du Pont Company.

Equipped with an extensive experience covering the selection and use of explosives, these expert "powder" men carry on their investigations in a thorough and efficient manner. The result is a practical and effective plan whereby the explosives required perform their work with a minimum expenditure of material, labor and time.

Put your powder problems up to du Pont—over 123 years of continuous activity in developing and making explosives for every requirement.

In quarrying operations use du Pont Explosives

There is a du Pont explosive to meet every blasting need—to do *your* particular work *best* at *least* expense.

Du Pont blasting accessories give you maximum efficiency from your explosives. Make every shot *sure*—protect your blasting investment by using only du Pont accessories.

For further information about du Pont explosives and blasting accessories, please refer to MINING CATALOG—METAL QUARRY EDITION and PIT and QUARRY HAND BOOK—or write to nearest office.

E. I. DU PONT DE NEMOURS & CO., Inc.
Explosives Department Wilmington, Del.



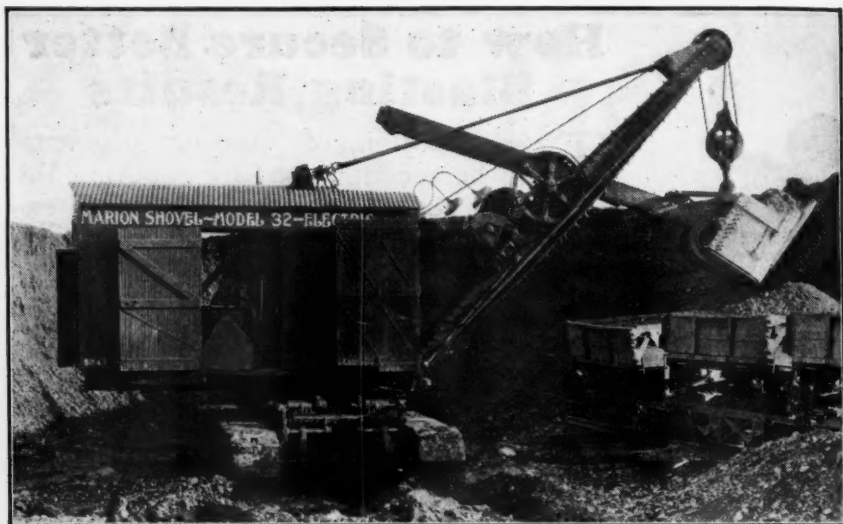
Du Pont chemical engineers insure uniformity of quality by chemical control through every step of manufacture from raw material to finished product.

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Seattle Wash.
Spokane Wash.
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*Du Pont Products
Exhibit
Atlantic City, N. J.*

POWDER MAKERS SINCE 1802



Marion Model 32, 1¼-yard Electric Shovel, owned by Consolidated Materials Corporation, Rochester, N. Y.

24 Hours a Day

Marion Electrics deliver a steady output 24 hours a day if necessary. No waiting for steam, or coal, or water—service as continuous as the current from the power house.

A shovel like this sets a task for the operator, but makes it comfortable for him through an inherent ease of operation built around the Marion system of three-motor control.

Where working conditions are suited to electric installations, many economies can be effected. Especially is this true when the operations are intermittent and the shovel is idle for considerable time at different periods during the progress of the work, as at these times no current is used except when the machine is in actual operation.

MARION

The Marion Steam Shovel Co., Marion, Ohio, U. S. A.



Jeffrey Heavy-Duty Bucket Elevators successfully handle Stone, Ores, Cement Clinker and similar materials in capacities up to 700 tons per hour.

Here Are the Features You've Wanted in a Bucket Elevator

HIGH quality steel chains with hardened steel knuckles to withstand the enormous driving action of the sprocket teeth.

Thru rods to keep the two strands of chain in perfect alignment at all times.

Hardened steel bushings thru the knuckles and fixed in the chain

side bar to protect the thru rods from wear.

Large self-oiling bushed rollers assembled midway in the link for carrying weight of chain and buckets and to reduce power consumption.

Renewable sprocket teeth.

Heavy steel buckets with reinforced lips.

Ask for complete details and prices.

The Jeffrey Mfg. Co., 917-99 North Columbus, Ohio
Fourth Street

New York
Buffalo
Rochester, N. Y.
Philadelphia
Pittsburgh

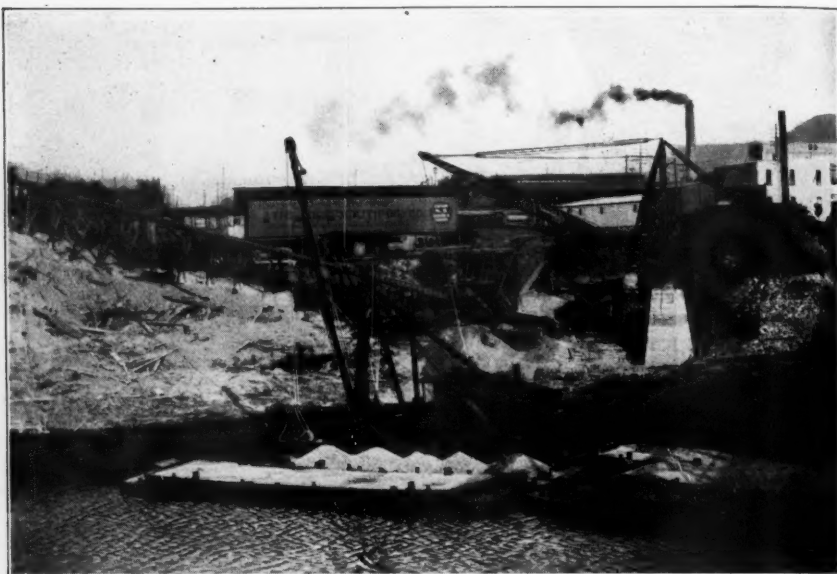
Seranton, Pa.
Boston
Cincinnati
Cleveland
Charleston, W. Va.

Chicago
Detroit
Milwaukee
St. Louis
Denver

Salt Lake City
Los Angeles
Birmingham
Charlotte, N. C.
Montreal

JEFFREY

MATERIAL HANDLING EQUIPMENT



“AMERICAN” Steel Stiffleg Derrick

Unloads Enough Material Each Day to
Keep a 1500-Ton Plant Going at Capacity

THE Portsmouth Sand & Gravel Co. produces 1500 tons of river sand and gravel a day. All of this material is unloaded from barges by an “AMERICAN” Steel Stiffleg Derrick powered with an “AMERICAN” $8\frac{1}{4} \times 10$ Hoisting Engine.

The “AMERICAN” Steel Derrick is the key machine of this big plant. If you have a material handling problem let our engineering department help you solve it. Cutting material handling costs is our business.



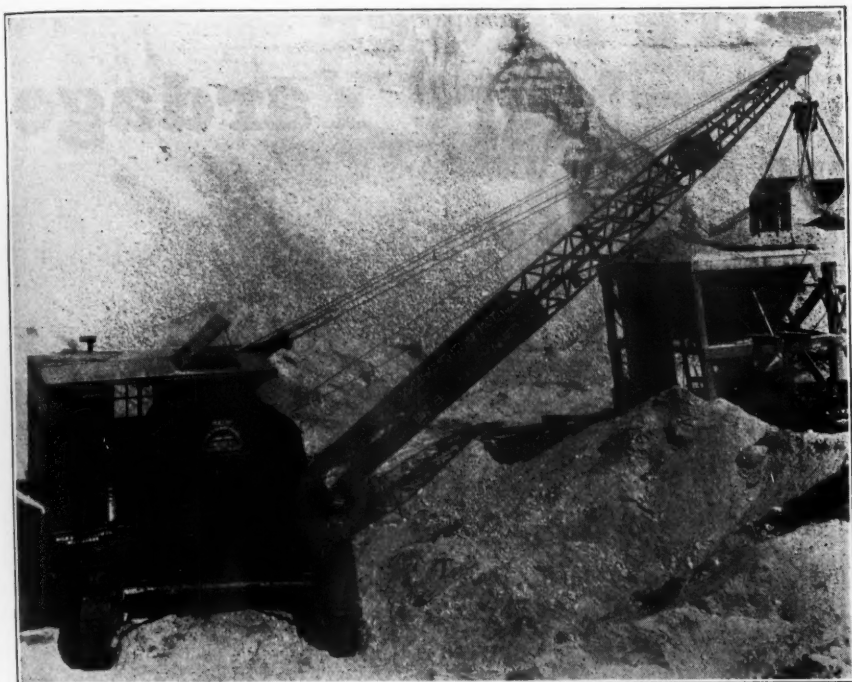
AMERICAN

HOIST & DERRICK CO.



Saint Paul, Minn.

New York, Chicago, Pittsburgh, Seattle, New Orleans



Here's How to handle gravel profitably

The Peterson Sand & Gravel Co., of Janesville, Wisconsin, know how to handle gravel profitably.

They use an O-S Type "E" Crane with 40-foot boom and 1-yard O-S Clamshell to load their hopper and a belt conveyor carries the gravel to the washing plant.

Many pit operators are using Peterson's System and their answer is "maximum yardage" at the end of each day.

The Type "E" is only one of the many sizes and styles of cranes we manufacture—

Send for catalog No. 37—it illustrates them.

ORTON & STEINBRENNER CO.

Locomotive Cranes, Flexible Tread Cranes, Gantry Cranes, Truck Cranes.

608 So. Dearborn Street
CHICAGO, ILL.

Clamshell Buckets, Orange Peel Buckets, Rock Crushers, Power Shovels.

More Power —More Yardage and No. 2 has More Power



When you hire a husky to handle a pick and shovel you look at the size of his muscles. When buying a steam shovel, look at the size of the power plant.

The No. 2 has the largest hoisting engine and boiler of any $\frac{7}{8}$ -yard shovel built. That's why owners are getting more yardage—and more profits.

Bulletin 68 tells all about this shovel. Have you your copy?

Gas Shovels • Locomotive Cranes • Clam-shell Buckets • Pile Drivers

C-2-93

McMyler-Interstate

NEW YORK
BUFFALO

PHILADELPHIA
PITTSBURGH

CLEVELAND

DETROIT

CHICAGO
SAN FRANCISCO

A. J. CLEMENTZ'S SONS
BUILDING SUPPLIES

OFFICE: 416 CANAL STREET
 MASSILLON, OHIO.

June 24, 1925

The Russell & Co.,
 City.

Attention of Mr. York.

Dear Sir:

You spoke to me the other day as to how we liked the new steam shovel we purchased from you some two months ago.

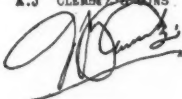
We are pleased to advise that the shovel has never caused us one minutes delay and has been operated continuously 10 hours per day from the time we received it from your factory.

The machine is the fastest and the most powerful shovel we have ever owned or have ever seen work.

This shovel wasn't sold to us by a salesman but was purchased by us on the performance, mechanical workmanship and construction and we believe we have the best steam shovel manufactured to-day.

We would be pleased to demonstrate the performance of the shovel to any purchaser you see fit to send to our plant.

Yours very truly,
 A. J. CLEMENTZ'S SONS.



WGC/MS



FASTEST and MOST POWERFUL

—day after day, in 10-hour stretches, A. J. Clementz's Sons find the Modern Massillon Steam Shovel to be about all a steam shovel possibly can be.

Continuous maximum production under the most trying conditions—that is what Modern Massillon Steam Shovels give—and with a very moderate maintenance cost. You'll find our descriptive booklet interesting. Send for a copy.

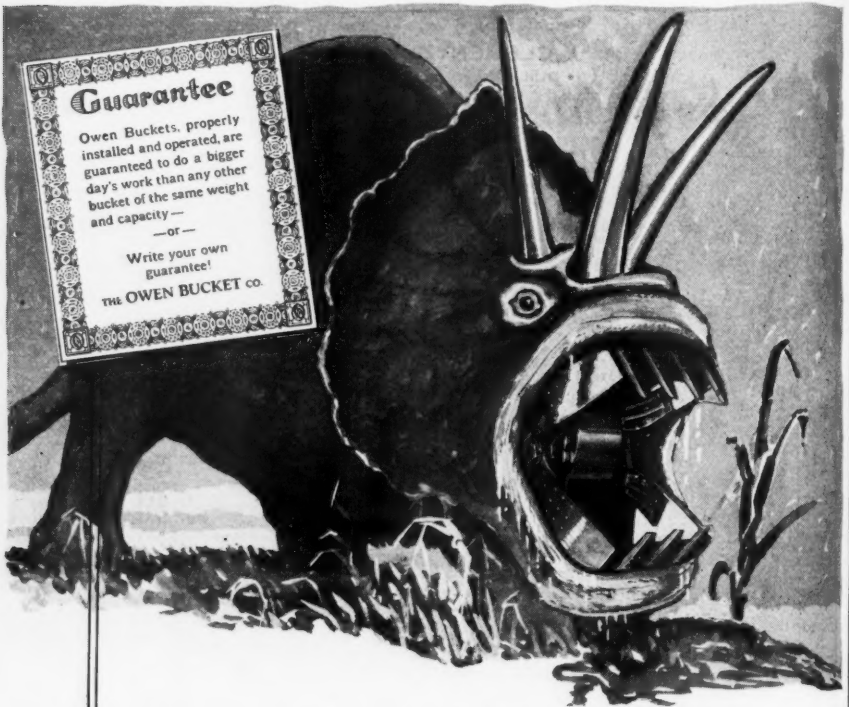
Built by
THE RUSSELL & CO.
 MASSILLON, O.

The **MODERN**  **MASSILLON**
 Steam — **3/4 - 7/8** — Shovel
 RANGE

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 C-2-93

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AGO
 1920



Guarantee

Owen Buckets, properly installed and operated, are guaranteed to do a bigger day's work than any other bucket of the same weight and capacity—

—or—

Write your own guarantee!

THE OWEN BUCKET CO.

A Mouthful at Every Bite

Centuries ago, in the wilds of western North America, the *triceratops* slowly plodded his way, ever onward—ever in search of prey.

This forbear of the modern rhinoceros held in his giant jaws an attack of crushing strength that brought him a mouthful at every bite.

And, too, an Owen Bucket possesses in its jaws of tremendous strength, a force that tears material from pile or ground—quickly and efficiently. Because of its scientific design and construction—in strict conformance to requirements under actual working conditions—the Owen Bucket outrivals the brute ability of the ruler of dinosaurs.

The story of Owen Buckets is told and illustrated in an interesting folder, which is yours for the asking. We'll send it promptly.

The OWEN BUCKET Co.

1006 Rockefeller Building

Cleveland, Ohio

Baltimore
Pittsburgh

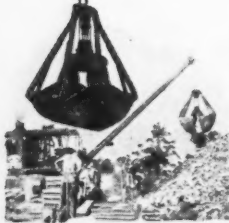
Chicago
New York

Dallas
Miami

Los Angeles
Portland

Minneapolis
St. Louis

Philadelphia
San Francisco



Excavating stiff blue clay with one-yard Type "D" Digging Bucket. One of three owned by D. W. Thurston Co., Detroit.



Owen Buckets

INSURE A BIGGER DAY'S WORK

© 1920

Hayward Buckets

Fitting the bucket to the job

Hayward Engineers have pioneered the development of every outstanding advance in the design of automatic grab buckets. They are particularly well equipped to help you make your digging dollars do a bigger and better job by showing how to harmonize bucket, hoist and service conditions—they can render a valuable service by fitting the bucket to the job.

Having devoted a major effort for more than 40 years to building better buckets, it is natural that we have the only complete line of buckets made. Our line includes every type and many variations of each—enabling you to obtain the correct type and size for any digging, dredging or rehandling purpose.

We shall be glad to send bulletins and catalogs on standard applications or supply data on special requirements.

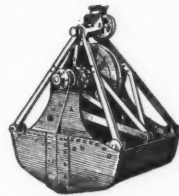
THE HAYWARD COMPANY

54-56 Church Street New York, N. Y.

Builders of Clam Shell, Orange Peel, Drag Line, and Electric Motor Buckets; Dredging, Excavating and



Coal Handling Machinery; Counterweight Drums; Automatic Take-up Reels.



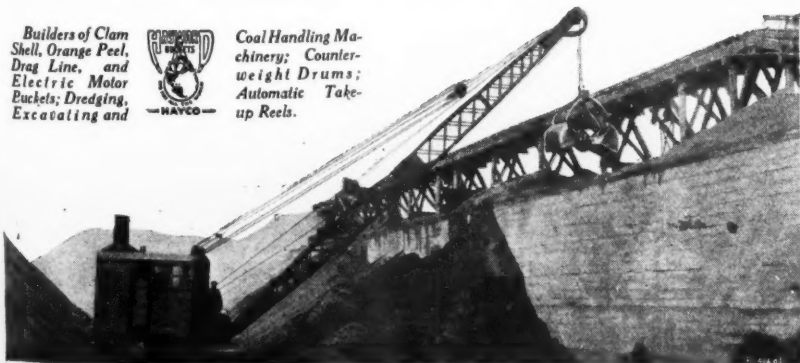
Clam Shell Bucket

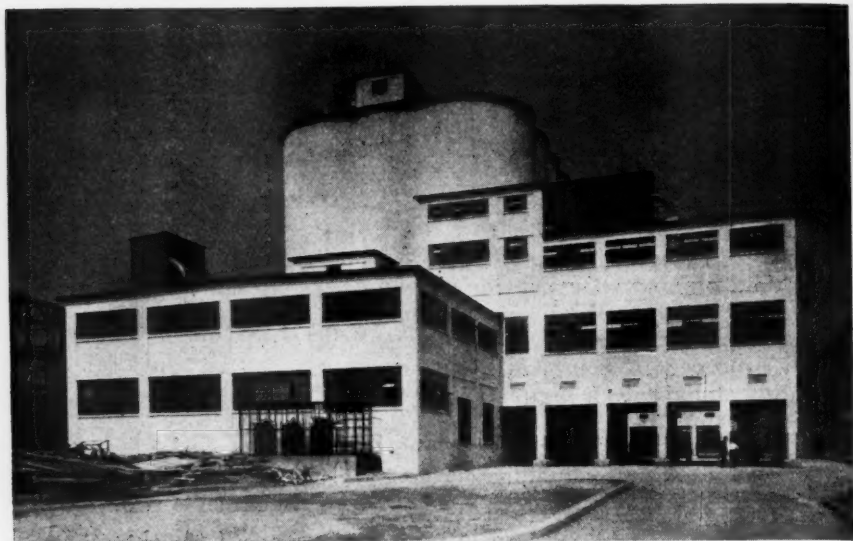


Orange Peel Bucket



Drag Line Bucket





Webster Material Handling Equipment

WEBSTER material handling equipment is used throughout in the packing and storing operations at the new plant of the Peerless Portland Cement Company at Detroit, Michigan.

This is but another of the many instances of implicit reliance placed upon Webster equipment by leading organizations everywhere.

Webster engineers have given years of study to correct material handling methods and can ably assist in selecting equipment to meet your particular requirements. Let them help you.

THE WEBSTER MFG. COMPANY
4500-4560 Cortland Street
CHICAGO



Three Motors in a Wintry World

Since August 15, 1924, these three type CS motors have been running as a test on a rough platform outside the Westinghouse East Pittsburgh plant. They are in the open weather, as here shown. To add spice to their existence, nitric acid (up to 25% concentration) has regularly been sprayed on them.

Nobody ever expected that these motors would keep going for a year under such handicaps, but they're still going strong. From every indication now they'll be running when the 1926 baseball season opens.

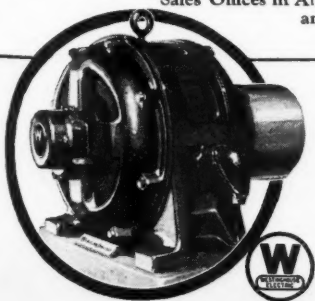
In this test you see how Westinghouse

insulation is balanced to all the other parts of the motor.

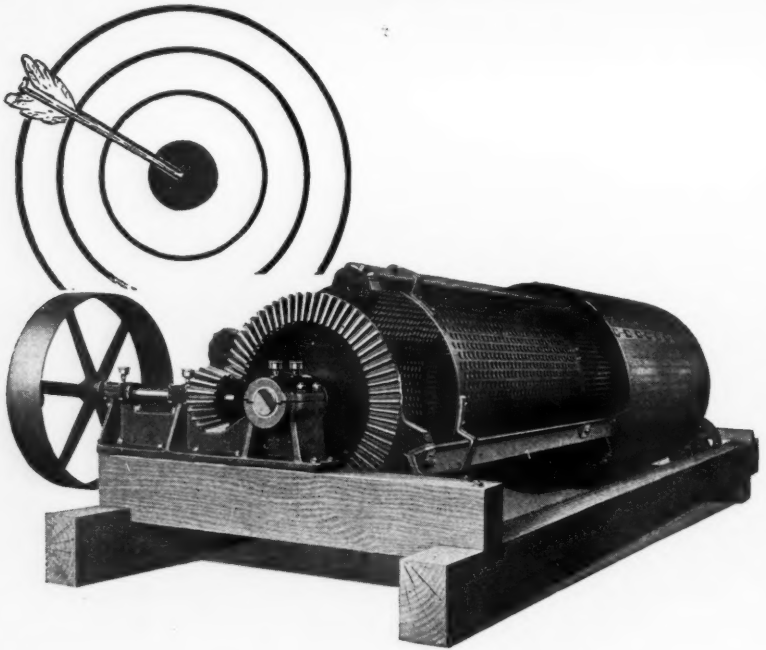
A majority of Westinghouse motors have mica for main insulation—more mica than will be found in any other motors. Mica resists heat, water and acid because it is a basic mineral.

Then, to make protection trebly sure, the windings of Westinghouse motors are dipped in varnish and *baked*. Only Westinghouse uses this process for motors for glass plant, brick plant, cement mill, quarry and other standard industrial service.

WESTINGHOUSE ELECTRIC & MANUFACTURING CO., EAST PITTSBURGH, PA.
Sales Offices in All Principal Cities of the United States
and Foreign Countries



Westinghouse Motors are Balanced



Our aim for Toepfer Screens

TOEPFER Screens are built especially to meet the needs of screening in pit or quarry, and that our aim to meet these needs has been successful is evidenced by the many highly satisfactory installations of Toepfer Screens.

Toepfer combination screens produce well washed and sized material at a lower cost in power and water than any other type of scrubber. Steel angles run longi-

tudinally with the scrubber section, which raise and drop the material and water continually, insuring a high grade product. The best of materials are used, and rigidity and perfect alignment are secured.

The Toepfer combination screen and scrubber will deliver as many sizes as our regular screen without additional space being required. A card request will bring you our catalog. Send for it today.

W. TOEPFER & SONS CO.

Broadway and Menominee St.,
MILWAUKEE, WIS.

TOEPFER

REVOLVING SCREENS

Telsmith For Steady, Economical Gravel Production

YOUR conveyors—are they alternately overloaded and empty? Your screens—are they flooded one minute and idle the next? If so, just remember that machinery, like humanity, suffers from irregular feeding. A steady flow of aggregate through your plant will insure greater daily capacity, better graded material and a lower cost per yard.

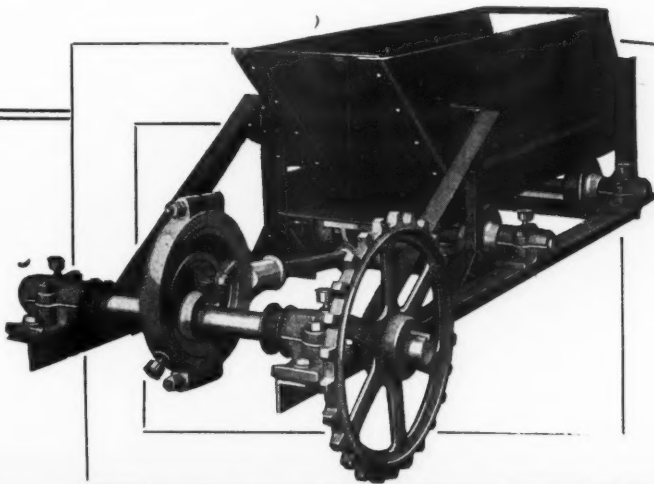
Take a look at the Telsmith Plate Feeder—an inexpensive but complete self-contained unit that will deliver gravel or stone at any rate desired. It's just a pan, actuated by a cam, with an adjustable eccentric to change the rate of feed. You can run this device for five years without noticing either the up-keep or power consumption. It's the cheapest, yet most valuable equipment in a quarry or gravel plant—something that the up-to-date operator can't afford to go without. Glad to send you bulletin FR-15.

SMITH ENGINEERING WORKS 3183 Locust Street, Milwaukee, Wis., U. S. A.

Old Colony Bldg.,
Chicago, Ill.
Selbert Milburn Co.,
Columbus, O.

18 East 41st St.,
New York City
Beckwith Mch. Co.,
Pittsburgh and Cleveland

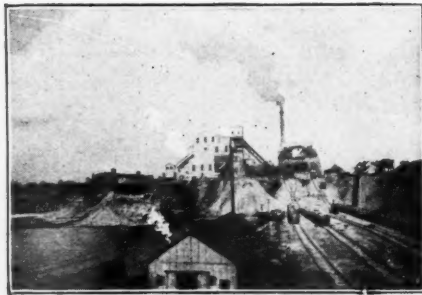
Waldo Bros. & Bond Co.,
Boston, Mass.
Borchert-Ingersoll, Inc.,
St. Paul, Minn.



COMPLETE EQUIPMENT

—for—

CRUSHING PLANTS



Engineering

Complete Plans Made by
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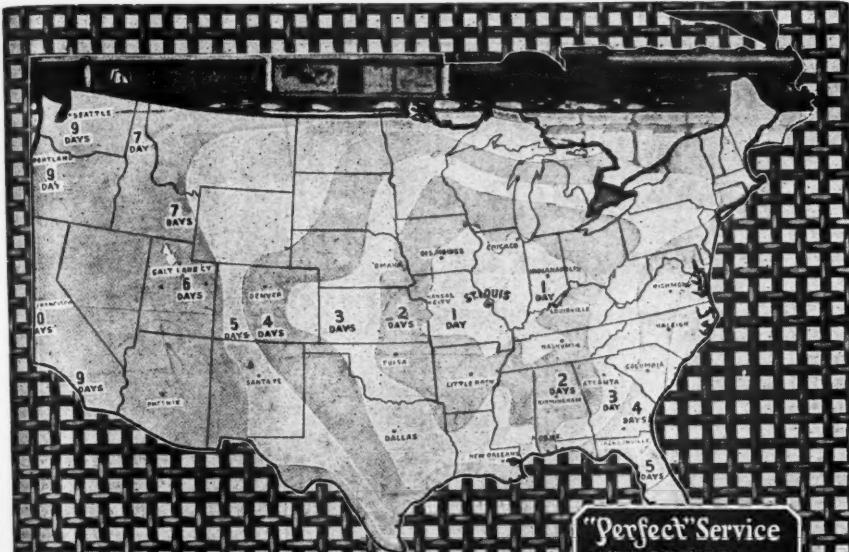
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Baltimore, Md.	4	Louisville, Ky.	1
Birmingham, Ala.	2	Macon, Ga.	4
Boston, Mass.	4	Memphis, Tenn.	2
Butte, Mont.	6	Mobile, Ala.	2
Cairo, Ill.	1	New Orleans, La.	3
Chattanooga, Tenn.	2	New York City, N. Y.	3
Chicago, Ill.	1	Omaha, Nebr.	2
Cincinnati, O.	1	Philadelphia, Pa.	3
Cleveland, Ohio	2	Pittsburgh, Pa.	2
Columbia, S. C.	4	Portland, Oregon	9
Dallas, Texas	3	Richmond, Va.	4
Denver, Colo.	4	Salt Lake City, Utah	6
Des Moines, Iowa	1	San Antonio, Tex.	4
Detroit, Mich.	2	San Francisco, Calif.	10
El Paso, Texas	5	Seattle, Wash.	9
Ft. Wayne, Ind.	1	Sioux Falls, S. D.	4
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*with the
Troubles Left Out*

WHY THEY LEAD

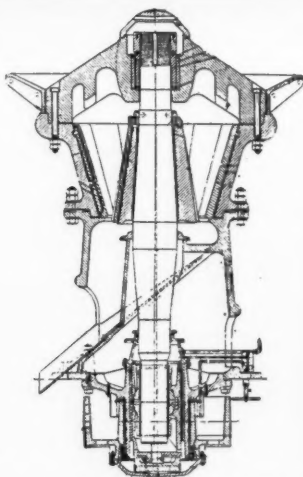
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- 12—Our fine crusher does the work of 4 geared crushers.

Send for catalogue and tell us what your problems are, and one of our experts will call on you without obligation on your part.

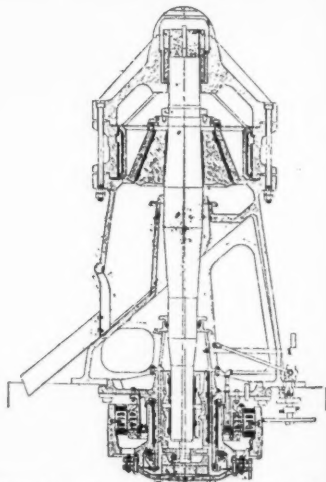
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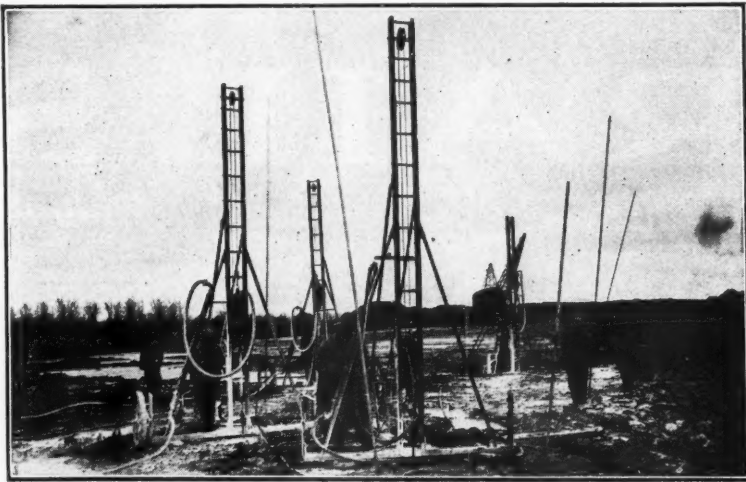
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Standard Ball Bearing Gearless Crusher.
Sizes No. 1 to No. 60—Weights 1,000
to 900,000 lbs.



Gearless Crusher for Fine Crushing.
Do not be deceived by Vertical Con-
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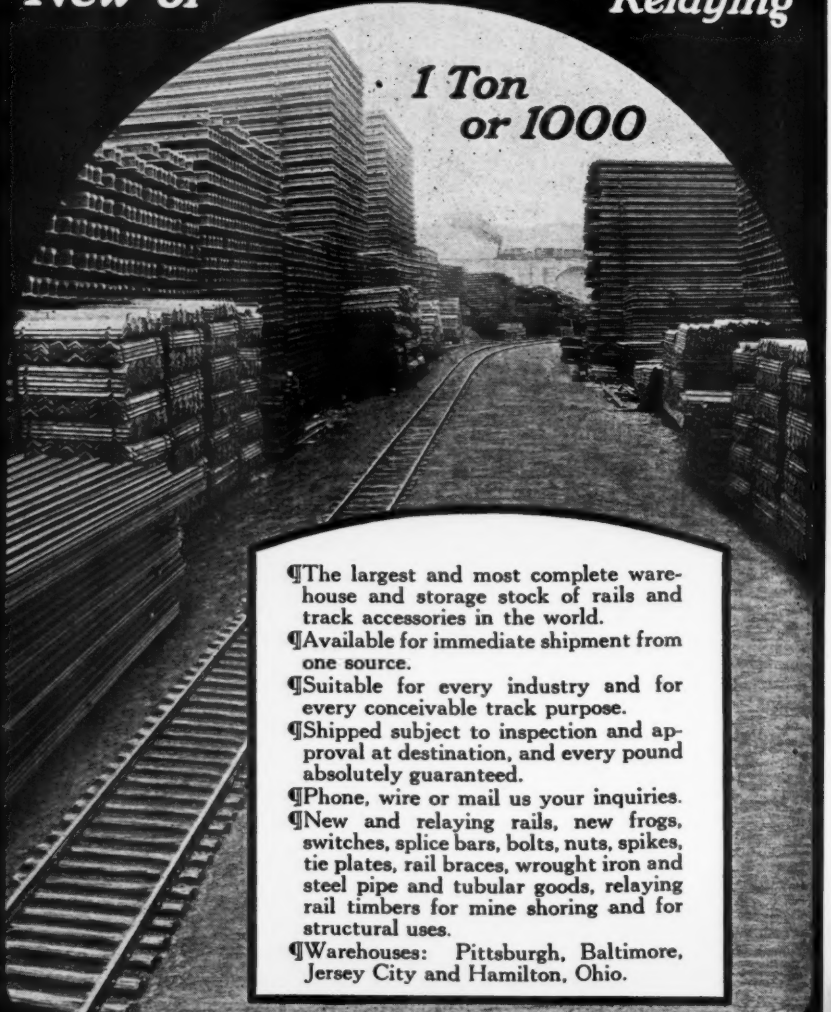
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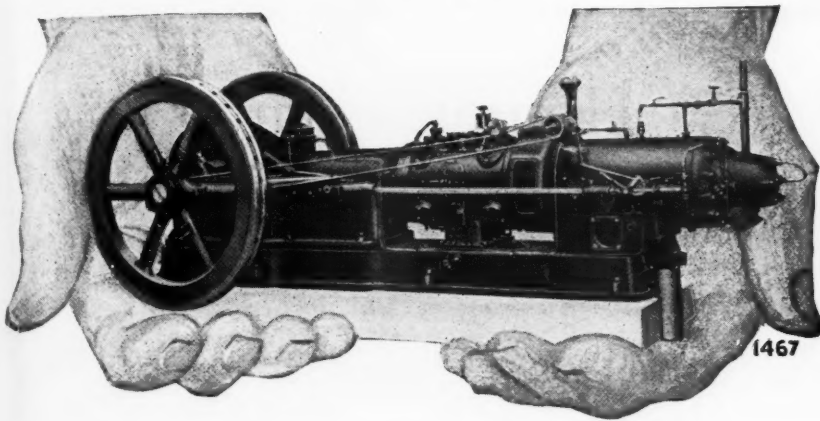
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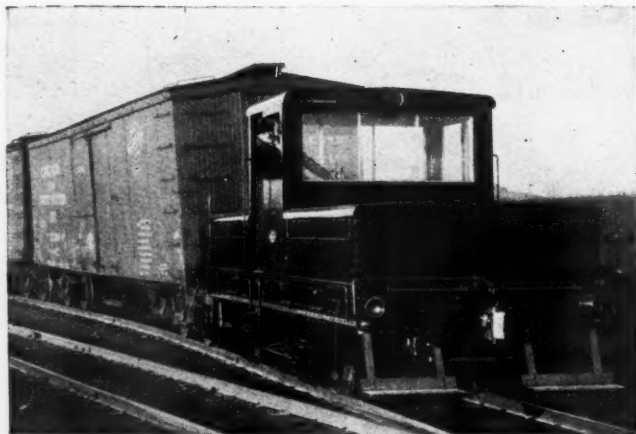
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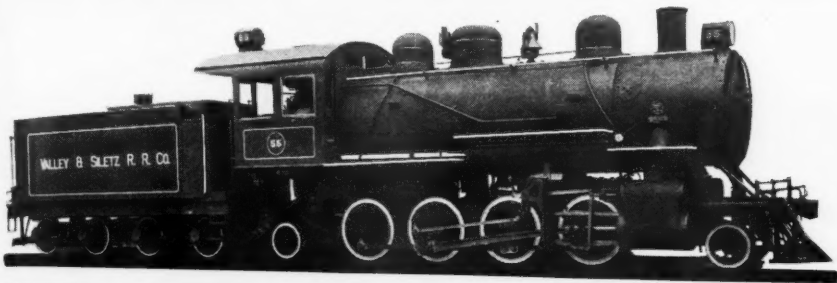
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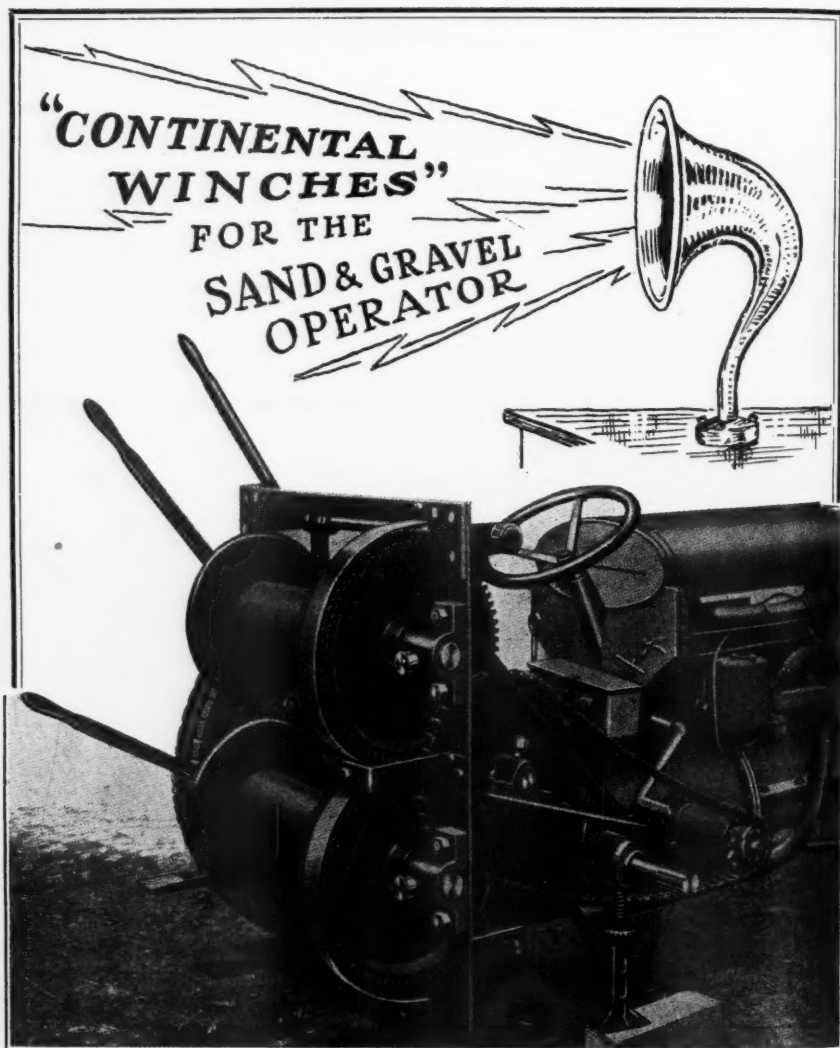


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The installation of one of these super-scales cannot fail to increase the confidence and goodwill of your trade. Moreover, it will probably pay for itself by eliminating the profit-dwarfing errors that cannot be avoided when a scale is taxed beyond its capacity.

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Please send copy of the Booklet "A Talk on Scales"; also Type "S" specifications.

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Company

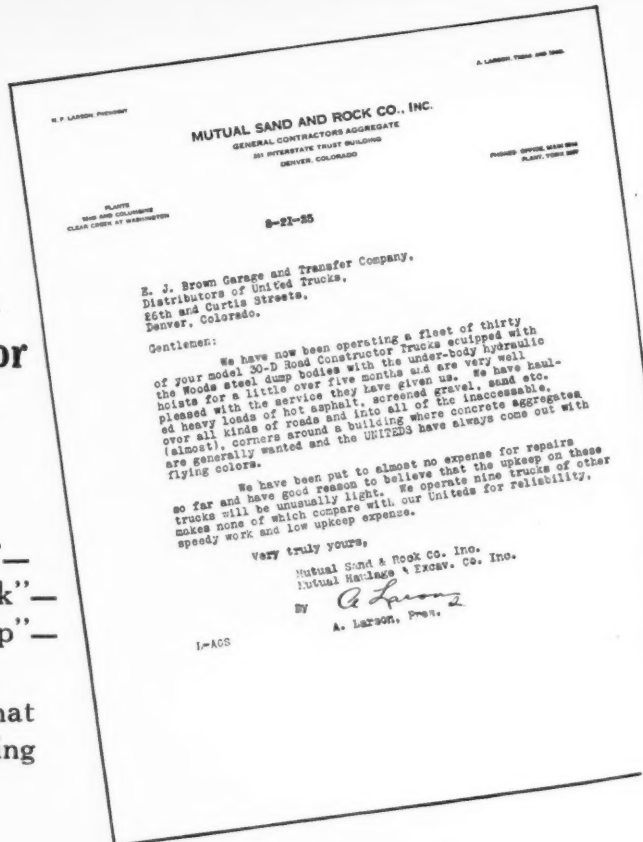


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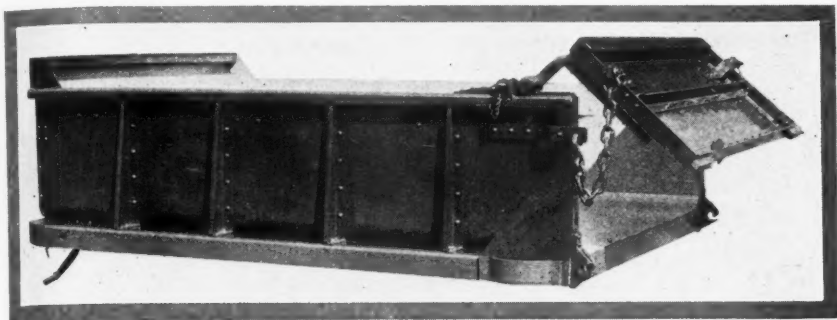
- Fire Brick
- Frogs and Switches
- Fuses, Blasting
- Gas Producers
- Gears
- Generators, Electric
- Grapple, Stone
- Grate Bars
- Grates
- Gypsum Separators
- Hoisting Engines
- Hoists, Chain
- Hoists, Derrick
- Hoists, Drum
- Hose, Sand Suction
- Hydrators
- Hydraulic Mining Nozzles
- Hydraulic Pipe
- Hydraulic Pumping Engines
- Hydraulic Valves (Pulpit and Indicator)
- Idlers, Belt Conveyor
- Industrial Railway Systems
- Kettles
- Kilns, Cement
- Kilns, Lime
- Lights, Carbide
- Linings, Bag and Barrel
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- Loaders, Boom and Bucket
- Loaders, Box Car
- Loaders, Conveyor
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- Locomotives, Gasoline (Gaugein.)
- Locomotives, Steam (Gaugein.)
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- Lubricators
- Magnetic Separators
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- Manganese Steel Parts
- Metal, Babbitt
- Metal, Perforated
- Meters
- Mills, Chaser
- Mills, Tube
- Mixers, Concrete
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- Motors, Gasoline Portable Power Unit (H. P.)
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- Nozzles, Suction Screen
- Oil Burners
- Oils and Lubricants
- Perforated Metal
- Picks and Shovels
- Pipe, Hydraulic
- Pipe, Iron
- Pipe, Spiral
- Plows
- Post Molds, Concrete
- Powder, Blasting
- Powder Magazines, Steel
- Power Transmitting Equipment
- Power Unit, Gasoline, Portable (H. P.)
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- Pulverizers, Ring
- Pulverizers, Roll
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- Pumps, Drainage
- Pumps, Dredging
- Pumps, Sand
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- Pyrometers
- Rail, Steel
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- Rope, Wire
- Sand-Lime Brick Machinery
- Scales, Automatic, Conveyor
- Scales, Track
- Scrapers, Power
- Scrapers, Team
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- Screens, Perforated Metal
- Screens, Rotary
- Screens, Vibrating
- Separators, Air
- Separators, Gypsum
- Separators, Magnetic
- Separators, Sand
- Sheaves
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- Shovels, Gasoline (.....yd.)
- Shovels, Steam (.....yd.)
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- Steel Barrels
- Steel, Drill
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- Steel, Manganese
- Steel, Structural
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- Stone Grapple
- Stripping Equipment, Power
- Superheaters
- Swinger, Derrick
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- Tackle Blocks
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- Washing Equipment
- Welding Equipment
- Winches
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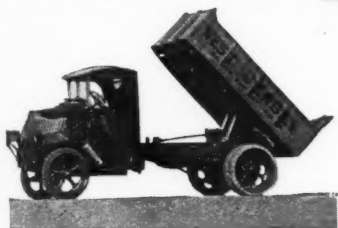
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Heil Body Model 32 is designed for truck owners who want a steel dump body built to stand up under the toughest hauling conditions of Pit and Quarry work.

Heil Dumps Bring Profits

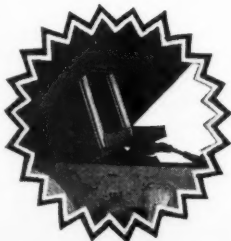


Twin Cylinders Twice the Power

The Heil Hoist will lift anything your truck will carry. Two pistons of solid steel raise the body to the highest dumping angles. No danger of back-tipping or side-sway.

The Heil Hoist occupies no loading space, is easy to mount and easier to operate. Two levers in the cab control the raising and lowering of the hoist—it can be held at any dump angle.

Heil also makes a complete line of Dump Bodies and Hoists for the Ford truck. Ask for Bulletin 150.



IN THE pit and out. Always on the job to do the job right. Bodies and Hoists built to stand the gaff of the heaviest loading and unloading work. Ask the West Jersey Sand and Gravel Co., their fleet of fifteen has given service plus.

Heil Dumps mount on any make or model motor truck. Made for hauling sand, gravel, crushed stone, concrete, clay, cinders, coal, ashes, rubbish and for every hauling purpose. Note how well Dump Body No. 32, shown above, is reinforced with gusset plates and braces. The tailgate is protected by a bumper bar on each side.

Send in the coupon below for Catalog describing all Heil Dump Body and Hoist Models.

THE HEIL CO.

1139-75 Montana Avenue Milwaukee, Wis.

One of our Twenty-five Distributors is near you.

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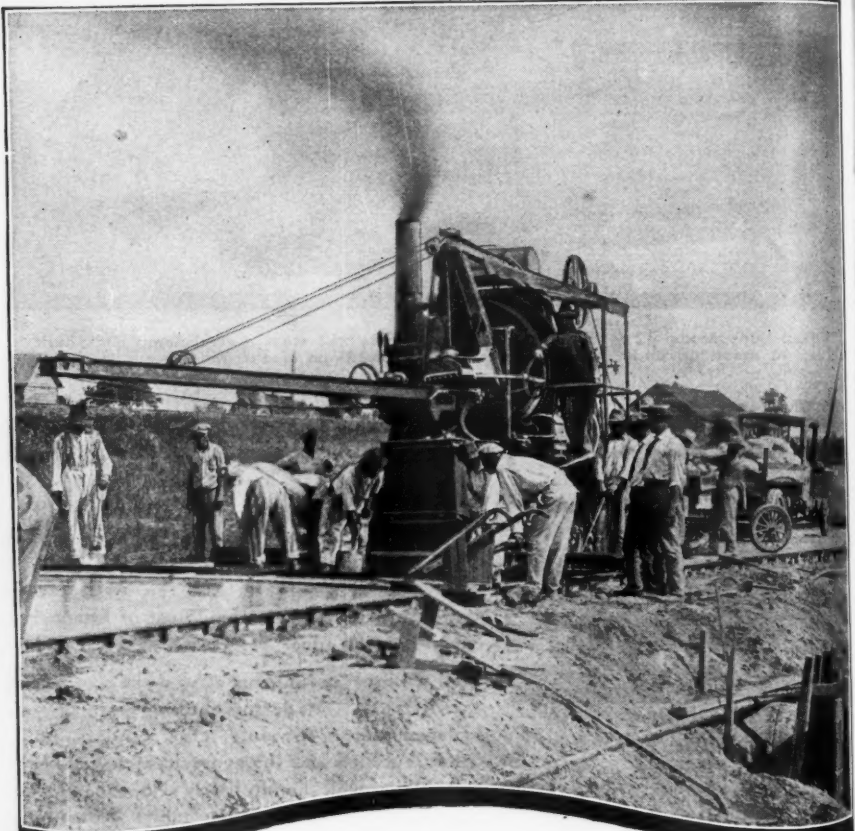
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IXL Speed Reducers and IXL Transmissions are used as standard equipment by many manufacturers of gasoline engines, cranes, dredges, shovels, hoists, excavators, cement mixers and other road building machinery.



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Put your problem up to our engineers

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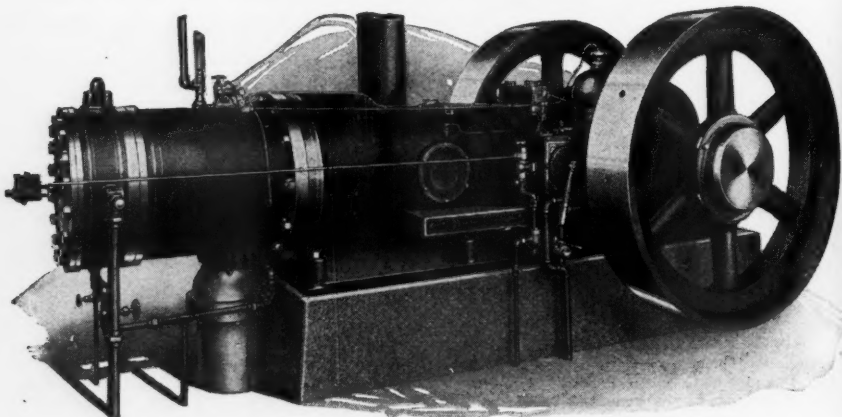
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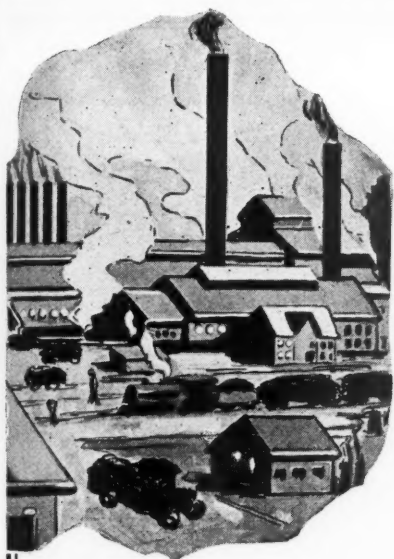
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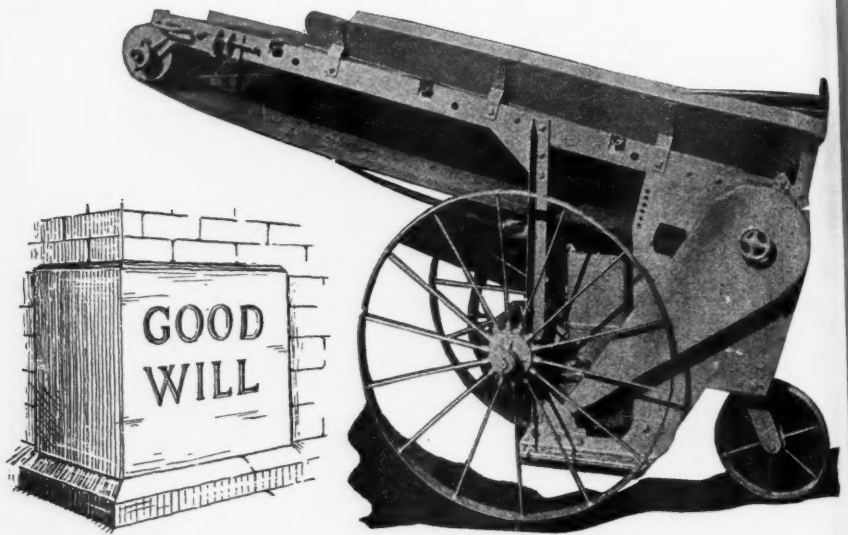
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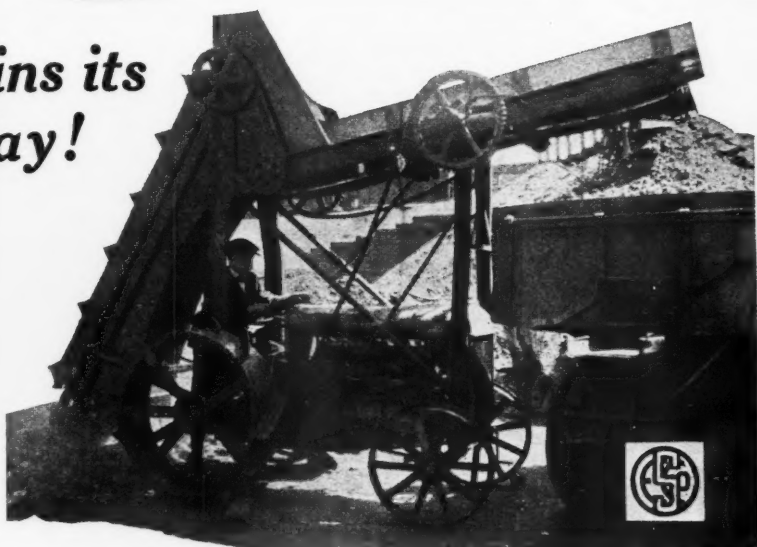
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Pit and Quarry

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BY *A. H. Lloyd*
A. H. Lloyd
General Manager.

AHL...H



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Pit and Quarry

A Semi-Monthly Publication for Producers and Manufacturers of Sand, Gravel, Stone, Cement, Gypsum, Lime and Other Non-Metallic Minerals.

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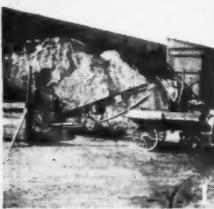
HAROLD W. MUNDAY

Editor

Associate Editors

E. D. ROBERTS

GEORGE B. MASSEY



1—An electric driven "U" loading wagon for the Consumer's Company, Chicago. Notice how easily two men can keep the machine going to capacity.

2—A Barber-Greene "U" unloading a box car of anthracite in 4 hours for the Lorr Brothers Coal Company, Chicago. Wheeling is eliminated and but two helpers are used.



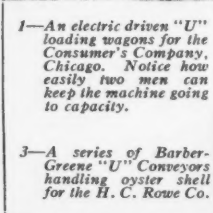
Tear this out and send for "Mr. Barber's Scrapbook" and complete information on the "U" Conveyor.

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3—A series of Barber-Greene "U" Conveyors handling oyster shell for the H. C. Rowe Co.



4—A "U" loading sand in a sand pit. Notice how the sand is screened. One man loads 3 yards in 15 minutes. Two men load 3 yards in 3 minutes.
5—A Barber-Greene "U" loading brick into trucks from a kiln for the Onondaga Brick & Tile Co., Onondaga, New York.

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What the low price of \$448.00 for the Barber-Greene "U" equipped with a 3 phase, 60 cycle, 220 volt, electric motor, means is almost self evident.

For an exceptionally low investment from two to ten men, depending upon the routine of the work, can be eliminated from the yard gang payroll. With competition as keen as it is, such a reduction of handling costs, and hence production costs, is obviously desirable.

For instance, the Barber-Greene "U" reduces the car unloading gang to one or two men. It has a cleated belt—and a low charging end that can be easily nosed beneath hopper-bottomed cars. These two features help the Barber-Greene "U" to unload from 200 to 400 tons of coal, or a proportionate quantity of gravel or other materials, per day.

That means good-bye to slow, inefficient unloading—good-bye to high unloading costs—good-bye to excessive labor turnover—good-bye to an extra production charge.

The Barber-Greene conveying belt is edged with clips that provide a troughing effect, and eliminate wear between the belt edge and the conveyor frame. Two steel channels make a husky, rigid conveyor frame.

The Barber-Greene "U" is a he-man-conveyor in a small size. Its cleated belt carries the large lumps that the ordinary baby conveyor can't handle. The discharge end can be quickly raised from five to twelve feet. That reach enables it to fill ordinary bins, build small stock piles, work into sheds, and to load trucks or cars.

Now check all these things against the price of \$448.00. Check the men that can be saved, check the features that assure long life and fast handling. Then check the coupon for additional information on this fast, low-priced conveyor.

The Barber-Greene "U" may also be had equipped with a 4 h. p., Fuller Johnson, gas engine, \$485.00, or with an electric motor that meets your needs. Prices on different types of power vary slightly, and are reflected in the price to the user.

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Pit *and* Quarry

Vol. 11

Chicago, Ill., October 1, 1925

No. 1

Something to Think About

CONSIDERING the recent hearing by the Interstate Commerce Commission held in Chicago for several days starting September 9th, we see cause for concern on the part of the non-metallic mineral industries. It was decidedly evident that the Commission will attempt to accomplish the purport of the Hoch Smith Resolution, namely, to reduce the freight rates on agricultural products. It could also be seen that this cannot be accomplished at the expense of the railroads but will necessarily be at the expense of other industries.

Everything presented during the hearing involved the farmer's attitude and the railroad's attitude. Those presenting the railroad's position were aware that the farmer would be the chief obstacle to overcome in any freight rate increase in the western territory. The Hoch Smith Resolution ordered the investigation in the hope that the freight on farm products could be reduced. Bankers, railroad officials and economists were presented to testify before the Interstate Commerce Commission that the farmer is financially able to pay the desired freight increase. While it is generally recognized that the farmer is returning to a stage of prosperity, it must be remembered that he has not fully recovered from his recent depression; that he will resist with great force any action that impedes full recovery; that the general investigation was ordered largely for his benefit because of his political influence; and that about the time the Commission will be through with its investigation the national political issues will again be before the country and the political advantage of the farmer will be enhanced.

There is so little chance that the Hoch Smith Resolution will be repealed that we urge more consideration of the problem involved. The following quotation shows clearly the agricul-

tural background of the issue:

"In view of the existing depression in agriculture, the Commission is hereby directed to effect with the least practicable delay such lawful changes in the rate structure of the country as will promote the freedom of movement by common carriers of the products of agriculture affected by that depression, including livestock, at the lowest possible lawful rates compatible with the maintenance of adequate transportation service: Provided, That no investigation or proceeding resulting from the adoption of this resolution shall be permitted to delay the decision of cases now pending before the Commission involving rates on products of agriculture, and that such cases shall be decided in accordance with this resolution."

Farm products represent an important portion of the tonnage of western railroads, and so the hearing held in Chicago offered an opportunity to study the part the farmer will actually play in the Commission's endeavor to carry out the intent of the Hoch Smith Resolution. As a result of our attendance at this hearing and contact with the varying interests present, we believe that the position of the farmer has not been affected by all the testimony offered. It is reasonably certain that he will not be asked to take an increase, and it is still likely that he will have something in the way of a reduction. The purpose and intent of the Hoch Smith Resolution has to be upset before the decrease in rate in agricultural products can be denied. If reductions are made in rates on agricultural products, it will necessitate increasing the rates on other commodities. Such increases would naturally be passed along to those commodities which offer the least resistance. In this class will be found the non-metallic industries as compared to the resistance of the packing, lumber, coal, automobile

industries, which have consistently fought in an organized manner the freight rate structure as it affected them.

The other alarming factor was the conclusive evidence offered by the western railroads in support of their contention that they are in need of a general increase in freight rates. The Transportation Act of 1920 was intended to assure the carriers a fair return upon the value of their properties, and not since the act was passed have the majority of the railroads enjoyed the return allowed. The commissioner in charge of the hearing indicated, by various questions directed at several officials, an interest in the proposed plan to have all the railroads pool the earnings resulting from a freight increase. In the questions we recognized that the plight of the railroads is appreciated, that a probable increase is recognized, and that this increase might be kept to a minimum by a system of pooling the earnings resulting. The railroads seemed decidedly opposed to a pooling of the earnings resulting from an increase. That is a problem of the railroads. The fact that an increase is more or less recognized as a necessity is something of interest to the non-metallic mineral industries. We now have the possibility of a general increase in freight rates with the exception of the rates on farm products. The burden might even be increased by allowing a decrease on farm products also. It is entirely possible that the Commission would order a pooling system of the earnings from a general increase to apply over the national railroad system.

The necessity for a general rate increase for the western railroads at least has been proven by facts to be necessary. The natural feeling is that if there are any increases on any products, there should be increases on all. Here again the non-metallic mineral industries would probably have an increase out of proportion with the other industries. This would result from the resistance that these other industries would offer as they have in the past.

It seems to us that those industries, which have consistently resisted freight rate increases and have diligently insisted that the railroads understand their problems, have done so at a profit to themselves in so far as freight rates are concerned.

Rates should be proportionate to the service rendered and not according to the shipper ability to pay. Because we believe that even the present rates in general in effect on the products of the non-metallic mineral industries are high in proportion to the service rendered other industries for the equivalent rate, we maintain that not only should the non-metallic mineral industries be excepted from a general increase, but also that the merits of a decrease in the present existing rates should be investigated. This can be accomplished only by presenting the facts to the Interstate Commerce Commission. This affords an opportunity for the various associations to function in an unselfish manner for the interests of their respective groups from a national standpoint.

All interests represented in the recent hearing in Chicago will meet again in Chicago on October 26th. Other hearings will be held in Minneapolis and St. Paul on November 9th, in Denver on November 16th, in San Francisco on November 23d, in Dallas on December 2nd and in Kansas City on December 14th. Final arguments in the case will be heard by the Commission as a whole in Washington. It will probably be early in the fall of 1927 before any decision will be announced. The opportunity to thwart a possible general increase in freight rates is at hand. In addition, an issue is present on which greater cooperation can be realized, which in itself is a worthy goal of any industry.

The trade associations in the non-metallic mineral industries are doing a great constructive work in stabilizing their respective groups. Their annual and semi-annual meetings have been of great benefit to many of the individual members. To our knowledge they have done practically nothing relating to this issue of freight rates. It is generally argued that associations should not adopt a legislative program. We believe this attitude should be reconsidered in light of recent decisions of the Supreme Court regarding association activities. We earnestly recommend that all associations consider the issues involved in the present freight rate investigation and that data be presented on their individual industries to the Interstate Commerce Commission to prevent an increase in freight rates on their products and to secure a reduction if possible.

An Unusual Cement Quarry Operation

By E. D. Roberts

FACILITIES have been installed in the new quarry, and the Beaver Portland Cement Company is now shipping lime rock from its quarry at Marble Mountain to its plant at Gold Hill, Oregon, a distance of about thirty miles. The development of this new quarry has been on such a scale as to suggest future expansion by this company.

The Beaver Portland Cement Company operates a one kiln cement plant at Gold Hill, Oregon, where its shale is quarried. The lime rock was originally secured about a mile from the mill. This lime deposit was not large enough to allow the company to operate to the capacity desired and has been abandoned in favor of the new deposit at Marble Mountain. The deposit at Marble Mountain has been tested to a depth of 400 feet and extends for a distance of three miles across the country. Most of this territory has been secured by the company.

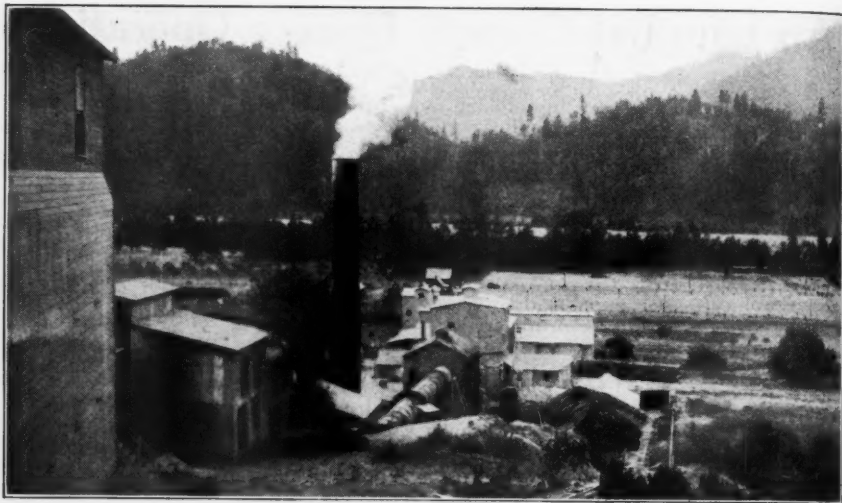
The lime rock is mined by a number 40 1½-yard Marion steam shovel which dumps the rock into 5 yard Western dump cars. These cars are handled by a 5 ton standard gauge American locomotive in trains to the crusher where the cars are side dumped into the crusher hopper.

A 30 inch Traylor crusher breaks the rock to a maximum size of 4 inch, dropping it onto an inclined screen, which allows the fine particles to fall onto a belt conveyor. The large pieces of rock are divided, each stream falling into a number 5 McCully crusher which reduces the rock to 2 inch maximum and discharges onto the same belt that was mentioned above. This belt carries the crushed rock to the storage bins, which have a capacity of 500 tons.

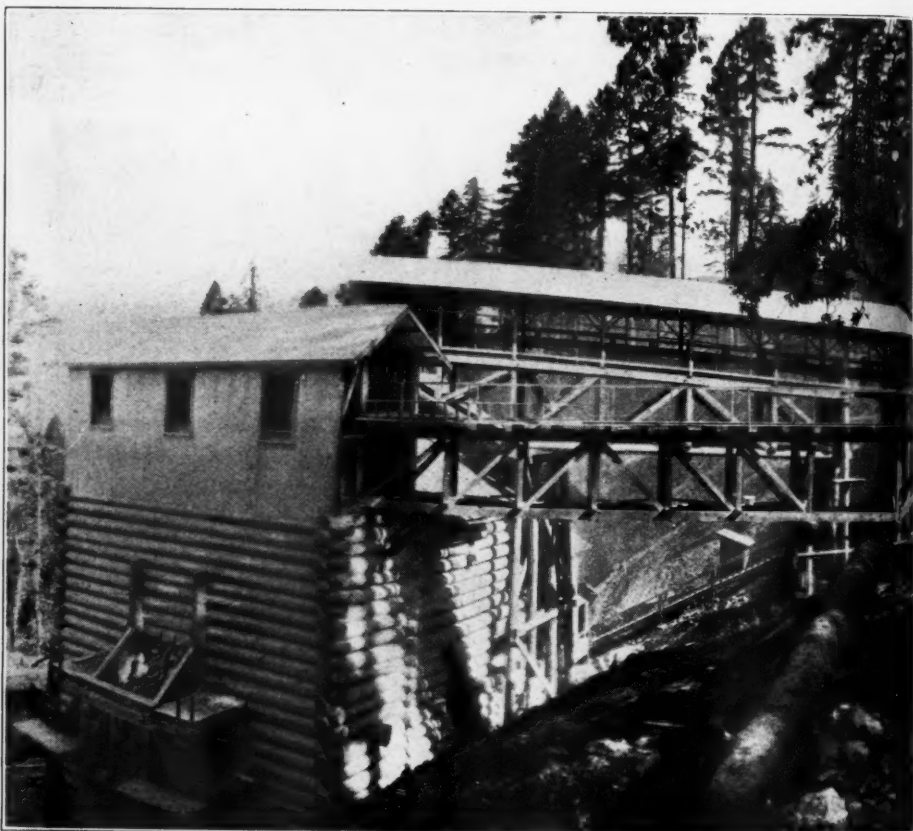
Vertically operated ratchet gates control the flow of rock from the bins into the tram cars. These 15 ton Western dump tram cars are handled in pairs attached to a cable which



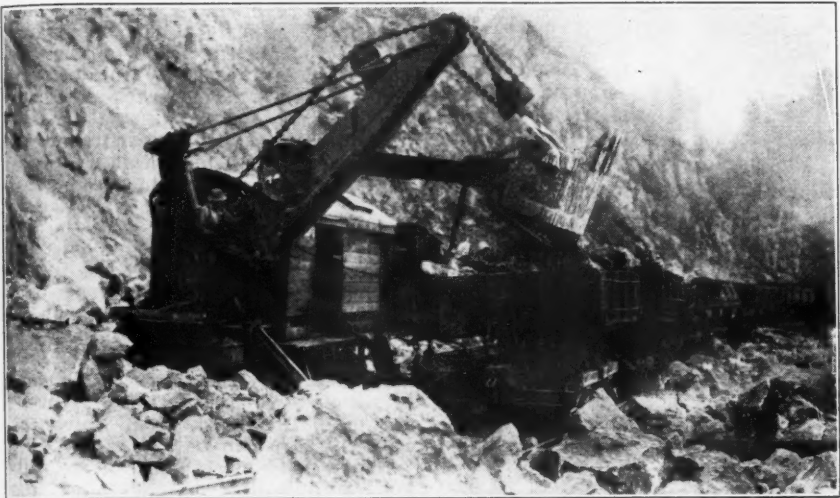
Showing the Trap Tunnel and Working Face of Quarry



Looking Down Along Mill



The Loading Bins at Left—Belt Conveyor



Shovel Loading Dump Cars In Quarry



Under Cover—Crushing Houses at Right



View Showing the Inclined Tramway

runs over the control hoist and fastens to another pair of cars. The loaded cars haul back the empty cars, but a Willamette Steel and Iron Works hoist operated by a 100 H.P. motor controls the cars. The hoist is equipped with air brakes.

A feature of the tram line which is worthy of attention is the provision at the passing track to keep the cable over on the proper line. At the center of the passing track the track is raised about two feet above the grade line of the rest of the tramway. When the car drops off this raise, the cable catches in the sheave located at the peak of the raise and keeps the cable at that point while the car is below it. The tram line is 4,500 feet in length with a difference in elevation of its ends of 1,400 feet.

At present the loaded tram cars dump directly into the standard gauge cars below the end of the tram. Provision has been made for sufficient elevation to construct storage bins at the main line track from which the railroad cars can be loaded.

Three miles of standard gauge railroad were built from the end of the tramway to the terminus of the California and Oregon Coast Railroad. They have named this new railroad the Marble Mountain Railroad. The California and Oregon Coast Railroad hauls the rock to Grants Pass where the cars are turned over to the Southern Pacific Railroad Company which completes the haul to Gold Hill.

The steam shovel is now working on a face which will develop into a 400 foot height for 1,000 feet in length. Additional development is provided by a 14 x 14 foot tunnel for trapping the rock into the cars in case of shovel trouble. This trap tun-



Car of Oil Shale Coming from Trap Tunnel

nel will produce 300 tons of rock on one shift working on a 300 foot face.

Mr. C. W. Martin, Superintendent of the plant, designed and superintended the construction of the quarry development which with the railroad required eight months to construct.

Arriving at the plant in bottom dump railroad cars, a spot is made over a reinforced concrete hopper, and the rock is dumped into it and drawn from there into a 2 yard car which is hauled up an incline to the top of the raw mill where it is dumped into the lime rock bins to be drawn off as desired. In case the raw mill bins are full, the cars are spotted on a trestle 200 feet long and the rock bottom dumped through to storage. A 10 ton Brownhoist locomotive crane moves the rock back from the track if extensive storage is required. A considerable storage is maintained here for reclaiming by the Brownhoist locomotive crane if the regular supply is curtailed or shut off for any reason.

Shale is quarried by the "Sweede trap tunnel" method from the hillside above the plant. The cars dump it directly into a Gates crusher for preliminary grinding after which a bucket elevator deposits it into the raw shale bin.

At present, development work is in progress to secure a supply of silica rock for sweetening purposes. This is also secured from the hillside above the plant and will be hauled by cars to the Gates crusher used for the shale where it will be broken to the desired size.

Gypsum comes from Nevada and is unloaded and handled by the locomotive crane. This crane also spreads the hot clinker on the clinker pile and reclaims it as required, dropping it with the proper amount of gypsum into a hopper feeding the dry mills.

The plant has been given considerable help by gravity and very few elevators are required. A 10 x 200 foot Allis Chalmers kiln discharges directly into the open air although a 60 foot cooler is installed. It is thought that the clinker grinds more easily by air cooling and water quenching than by running it through a cooler.

Allis Chalmers ball and tube mills are used for the wet grinding while a Sturtevant duplex mill and 3 Allis Chalmers tube mills are used for the finish grinding.

The cement is stored in wooden

silos having a capacity of 50,000 barrels of cement. Shipments are made either by truck or railroad. A three tube Bates packer sacks the cement which is dropped onto a belt conveyor which carries the sacks to the car and past a sack counter. This sack counter utilizes a productometer which records the number of sacks passing the point. Readings of the productometer are made before and after loading each car. The difference between the two readings minus the rejects gives the number of sacks in the car. The trucker also makes a check of the car, which is recorded, giving a very "foolproof" way of knowing and being able to stand by the number of sacks billed in the car.

Mr. D. L. Carpenter is President and General Manager; Mr. W. H. Muirhead is Vice President and Treasurer; Mr. L. H. Adams is Secretary; Mr. Buel C. Nelson, Assistant Secretary; Mr. C. W. Martin, Superintendent; Mr. L. L. Smith, Chief Chemist, and Mr. J. M. Macleay, Sales Manager. Portland offices are maintained at 1110 Porter Building, while the plant address is Gold Hill, Oregon.

Recent Patents

The following patents of interest to readers of this journal recently were issued from the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trade-mark attorney, Continental Trust Building, Washington, D. C., at the rate of 20c each. State number of patent and name of inventor when ordering.

1,553,063. Directly-driven slewing-gear for drag-line excavators. Oswald Bedgood, Glasgow, Scotland, assignor to Lobnitz & Co., Ltd., Renfrew, Scotland.

1,553,096. Tooth-connection for excavating implements. Walter J. Mullally, Chicago Heights, Ill., assignor to American Manganese Steel Co., Chicago, Ill.

1,553,202. Crushing-head. Edgar B. Symons, Los Angeles, Cal., assignor to Symons Brothers Co., Milwaukee, Wis.

1,553,203. Spring-head adjustment for disk-crushers. Edgar B. Symons, Los Angeles, Cal., assignor to Symons Brothers Co., Milwaukee, Wis.

1,553,293. Sledge-mill. Thomas J. Sturtevant, Wellesley, Mass., assignor to Sturtevant Mill Co., Boston, Mass.

Portland Cement Output in August, 1925

Production and shipments of Portland cement during the month of August were the highest ever recorded for any month in the industry, according to statistics compiled by the Bureau of Mines, Department of Com-

merce. Production shows an increase of more than 8 per cent and shipments of 9 per cent over August, 1924. Portland cement stocks continue the seasonal decline but are nearly 12 per cent greater than in August, 1924.

Production, shipments, and stocks of finished Portland cement, by districts, in August, 1924 and 1925, and stocks in July, 1925, in barrels.

Commercial District	Production August		Shipments August		Stocks at end of August		Stocks at end of July
	1924	1925	1924	1924	1924	1925	1925 ^a
Eastern Pa., N. J. and Md.....	3,621,000	3,726,000	4,263,000	4,402,000	2,092,000	1,784,000	2,460,000
New York.....	803,000	867,000	942,000	1,001,000	645,000	623,000	757,000
Ohio, Western Pa. and W. Va.....	1,707,000	1,810,000	1,882,000	1,905,000	1,018,000	1,517,000	1,612,000
Mich.....	1,105,000	1,192,000	1,175,000	1,285,000	521,000	873,000	967,000
Wis.b. Ill., Ind. and Ky.....	2,133,000	2,425,000	2,529,000	2,914,000	1,554,000	2,122,000	2,611,000
Va., Tenn., Ala. and Ga.....	1,049,000	1,302,000	1,241,000	1,263,000	414,000	303,000	264,000
Easter Mo., Ia., Minn. and S. Dak.c.....	1,596,000	1,632,000	1,660,000	1,952,000	2,046,000	2,080,000	2,399,000
Western Mo., Neb., Kans. and Okla.....	1,033,000	1,170,000	1,036,000	1,268,000	1,142,000	1,430,000	1,529,000
Texas.....	414,000	481,000	433,000	452,000	245,000	262,000	232,000
Colo. and Utah.....	283,000	210,000	259,000	230,000	191,000	362,000	382,000
California.....	1,063,000	1,181,000	1,056,000	1,234,000	334,000	381,000	435,000
Ore., Wash. and Mont.....	321,000	423,000	379,000	447,000	464,000	194,000	248,000

15,128,000 16,419,000 16,855,000 18,383,000 10,666,000 11,931,000 13,896,000
 a. Revised. b. Began producing June, 1924. c. Began producing December, 1924, and shipping January, 1925.

Stocks of clinker, or unground cement, at the mills at the end of August, 1925, amounted to about 5,643,000 barrels compared with 6,961,000 barrels (revised) at the beginning of the month.

Production, shipments, and stocks of finished Portland cement, by months, in 1924 and 1925, in barrels.

Another new plant, located in Ohio, is included for the first time in the statistics. The following tables, prepared by the Division of Mineral Resources and Statistics of the Bureau of Mines,

are based mainly on the reports of producers of Portland cement. The August, 1925, totals include estimates for two plants.

Month	Production		Shipments		Stocks at end of month	
	1924	1925	1924	1925	1924	1925
January.....	8,788,000	8,856,000	5,210,000	5,162,000	14,155,000	17,656,000
February.....	8,588,000	8,255,000	5,933,000	6,015,000	16,815,000	19,689,000
March.....	10,370,000	11,034,000	8,995,000	10,279,000	18,189,000	20,469,000
1st quarter.....	27,746,000	28,145,000	20,138,000	21,456,000	.....	.....
April.....	11,726,000	13,807,000	12,771,000	14,394,000	17,159,000	19,887,000
May.....	13,777,000	15,503,000	14,551,000	16,735,000	16,403,000	18,440,000
June.....	13,538,000	15,387,000	15,036,000	17,501,000	14,903,000	16,409,000
2nd quarter.....	39,041,000	44,697,000	42,358,000	48,630,000	.....	.....
July.....	14,029,000	15,641,000	16,614,000	18,131,000	12,319,000	13,896,000 ^a
August.....	15,128,000	16,419,000	16,855,000	18,383,000	10,666,000	11,931,000
September.....	14,519,000	.....	16,827,000	.....	8,404,000	.....
3rd quarter.....	43,676,000	.....	50,296,000	.....	.....	.....
October.....	14,820,000	.....	17,160,000	.....	6,073,000	.....
November.....	13,141,000	.....	10,289,000	.....	8,928,000	.....
December.....	10,435,000	.....	5,506,000	.....	13,913,000	.....
4th quarter.....	38,596,000	.....	32,955,000	.....	.....	.....
.....	148,859,000	.....	145,747,000	.....	.....	.....

^aRevised.

Transporting Sand By Aerial Tramway Over a Distance of Two Miles

By George Ransom

TRANSPORTING on an average 300 tons of sand a day by aerial tramway is an unusual operation in the sand and gravel industry. One of the most interesting sand producing operations in the country, and one which transports the sand produced a distance of two miles, is carried on by the Vermont Marble Company at Proctor, Vermont. This company required sand at all of its numerous mills where the marble is cut and rubbed preparatory to being polished by means of processes which it is not necessary to enter into here.

The pits from which the sand is obtained lie on the opposite side of a ridge of hills from Proctor. The supply is apparently unlimited in quantity. This is fortunate for an amount of between 250 and 300 tons per day is required.

The great problem, therefore, is that of economical transportation. To carry such large quantities by trucking and under such conditions as prevail would, of course, be prohibitive. The distance from the mills at Proctor

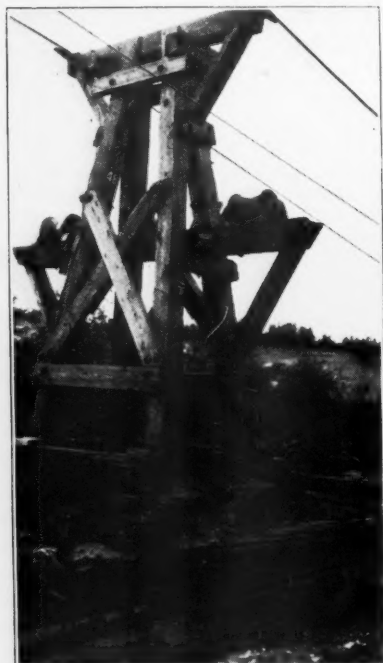
to the pits is about two miles in a straight line, and an aerial tramway has been constructed for the entire distance. An idea of the appearance of the line is given in the accompanying illustrations.

There are 52 wooden towers, the construction of which is shown in detail in the illustrations, especially in regard to the saddle for supporting the cables and the rollers below them to hold up the transmission cable. These towers vary in height from the two highest, which are 80 feet, to the lowest, which is only 15 feet.

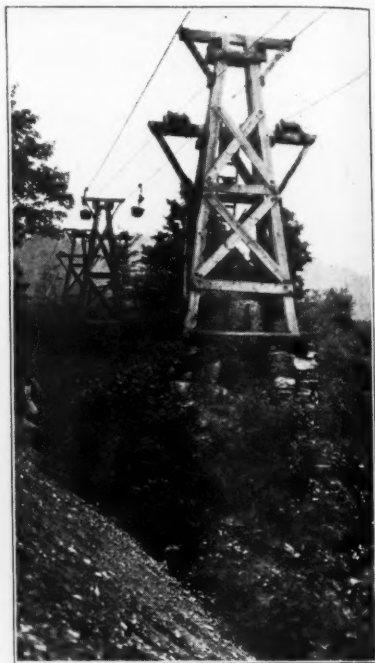
The supporting cables are American Steel and Wire Company's transmission cable with smooth surface, 1½ inch in diameter on the side for loaded buckets and 1 inch in diameter on the side for the empty buckets. Both tramway cables are given a quarter turn every two weeks to prevent uneven wearing. All pulleys and idlers are greased every week. The endless transmission cable by means of which the buckets are pulled is ¾ inch in diameter.



The Sand Deposit of Vermont Marble Company



View Showing the Tower Construction



The Tower Line-Up for Tramway



View in the Sand Pit



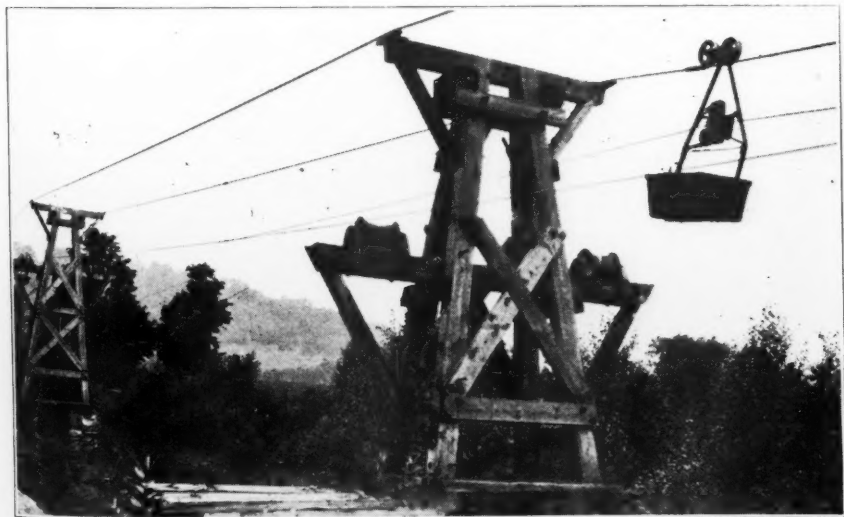
View of Tramway on Mountainside



Note How Path Has Been Cut Through

The buckets carry five hundred pounds of sand each, and they depart and arrive approximately every 27 to 30 seconds, thus delivering one ton about every two minutes. To do this they travel at the rate of 500 feet per minute and are spaced 200 feet apart

on the transmission cable. As the load is carried over the range of hills, the buckets on the down grade help to pull those on the up grade, so that the whole line consisting of about 50 loaded buckets and an equal number of empties is moved by a 25 H. P. mo-



View Showing Detail of Tower and Buckets



View of Screening Plant—At Right Is Grizzly—Belt Conveyor Under Grizzly Elevates the Sand

tor. In fact, if it were not for starting friction, a motor of about half the size would suffice.

At the Proctor end of the line every means has been taken to save labor in handling the sand. Some of it is used in the mills at that point, so an overhead monorail has been provided on to which buckets may be switched from

the cableway as they pass over the building where most of it is needed. The sand is dumped into bins, whence it is drawn when required.

In addition to this some five carloads per day are shipped by railroad to the company's other mills at West Rutland, Center Rutland, and elsewhere. The sand for this is dumped into bins



View In Sand Pit Showing Railroad Tracks



View Showing Shed on Top of Building Where Some of Sand Is Dumped

over a railroad siding, from which the cars are loaded from chutes by gravity.

The sand pits, or beds, cover a large area and are some 15 to 20 feet deep. The sand is taken out by means of an electric shovel, Type O, made by the The Automatic Shovel Company, and

is placed directly into dump cars of about 1 ton capacity by the shovel and hauled by a Plymouth gasoline locomotive to the screens over narrow gauge tracks extending back to the building where the buckets of the aerial tramway are loaded. The shovel is moved from place to place under its own power. While in



Chute for Gravel from Hummer Screen

the pits it is necessary for the wheels to rest on wooden platforms, or panels. Three of these are provided. There is one for the two wheels on each side, or end, and the third is placed alongside the others in the direction in which the shovel is to be moved.

The sand is first dumped into a grizzly, reached by an inclined trestle, which sifts out the few cobbles which occur in this bed. The stones roll off to one side, and the sand falls onto a belt conveyor. This conveyor carries the sand up to a Hummer screen, which separates out the gravel. This also occurs in only comparatively small quantities. It passes from the screen through a chute to a belt conveyor, which carries it up an incline from which it is dropped off at various places. The incline itself is movable so that the gravel may be piled up over a considerable area. The waste material, cobbles and gravel, are excellent for road work or filling in and will undoubtedly be used for these purposes.

The sand drops from the Hummer screen into bins, from which it is drawn by gravity through chutes directly into the bucket conveyors. The aerial tramway enters the building where these bins are located. As the buckets approach the bins, they are released from the transmission cable and pushed by hand along an overhead monorail under the chute. When loaded they are again pushed by hand to a man who, at intervals of about 30 seconds, pushes them on to the cableway, where they automatically engage with the transmission cable and start on their journey to Proctor. The monorail is inclined downwards in the direction in which the buckets are pushed.

With all this automatic labor saving machinery it is possible to dig and start on their way to Proctor the 275 tons (approximately) of sand per day with surprisingly few men. These are as follows:

- The engineer for the electric shovel and helper,
- The engineer for the gasoline dinky engine,
- Two men to load the buckets,
- One man to send off the buckets,
- Two common laborers to help in any way that is required,
- Foreman.

This number is subject to some slight variation as, for instance, when a new bed is being opened, one or two more men may be required.

There is direct telephone connection

between the sand pit and the man who controls the motor for operating the transmission cable at Proctor. This motor is equipped with an automatic compensator with push button control; and the push button is located adjacent to the telephone set, so that the man at Proctor can stop the buckets instantly without leaving the telephone if anything goes wrong.

As the mills which use the sand from these pits are kept going all winter, it is of course necessary to operate the pits steadily the year around. From this point of view the aerial tramway is the ideal method of transportation because it is entirely independent of the conditions of the roads, which are naturally subject to all the vicissitudes of hard winter weather.

A Dynamite Motion Picture

A one-reel motion picture entitled "Letting Dynamite Do It," has just been made by the Explosives Department of E. I. du Pont de Nemours & Company and can be had for distribution on application to the company. The scenes show the use of explosives in many lines of industry and under many conditions. Practically every part of the country has been combed for pictures showing the employment of dynamite, all of which are picturesque and many sensational. There are views of the use of dynamite in the lumber camps of the Pacific Northwest, where the explosive is used to cut off the tops of tall trees and break log jams; also scenes on the Mexican border, where a small mountain is converted into railroad ballast through the employment of thousands of pounds of dynamite. Other scenes show how reefs were blasted away in a Florida harbor, building a swimming pool in the East, taking out concrete foundations in the midst of a great plant without so much as breaking a window, and demolishing in a few minutes a disused blast furnace many feet in height. There are also scenes of the use of explosives in building roads in the West, the unusual application of dynamite in chipping out figures on Stone Mountain, where the great Confederate Memorial is being built, and then the spectacular feat of completely demolishing an old stone intake in Lake Michigan at Chicago which was a menace to navigation. This one reel picture is the second volume issued by the du Pont Company showing the use of dynamite in various operations throughout the country.

New Standard Gypsum Plant At Seattle

By E. D. Roberts

CONSTRUCTION of a two kettle plaster plant for the manufacture of plaster and allied products has now been completed and will soon be in operation on Harbor Island in the City of Seattle, Washington. The Standard Gypsum Company now operates a four kettle plant at Ludwig, Nevada, where they have made such a good showing that they have gone ahead with the present program for expansion, which calls for the construction of a three kettle plant at Long Beach, California.

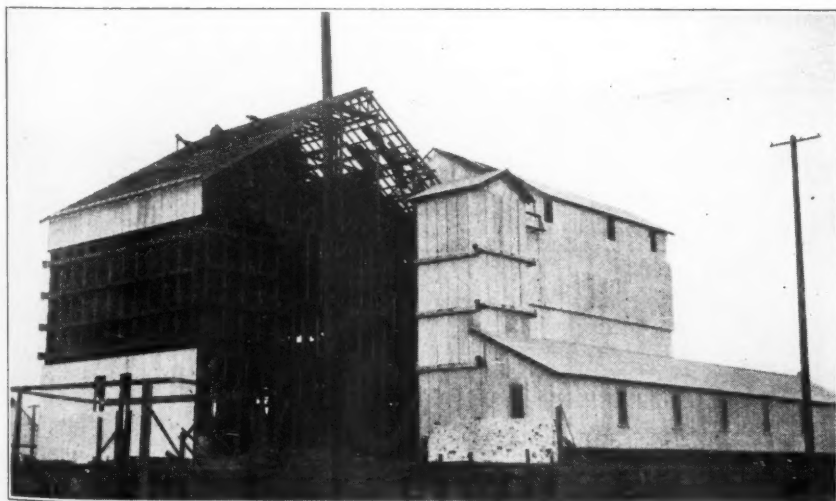
The gypsum rock will be purchased from the Company Occidental Mexicana and brought from the Island of San Marcos in the Gulf of Lower California in ships chartered for the purpose. They hope to handle the rock in their own ships in order that there will be no likelihood of anyone's chartering the ships away from them.

Dockage for the unloading of the rock has been provided for by a new dock 120 feet long, fronting on what is called West Waterway. Here the boats will be unloaded by a movable gantry crane operating on the dock. The rock will be dumped into a movable hopper which is located over a 30-inch belt conveyor constructed along the face of the dock just below the floor level. This belt discharges onto an inclined 30-inch belt operating

at right angles to the first one, which carries the rock up to the top of a trestle 40 feet in height constructed over the storage area. A traveling tripper discharges the rock to the pile below. The stock pile will be 40 feet in height and 295 feet long with a capacity of 20,000 tons of gypsum rock. About half of this is live storage, which will flow to the openings in the top of the tunnel constructed along the center of the stock pile.

The stock pile is enclosed by a corrugated iron building to keep the rock dry. The Seattle climate is wet a great deal of the time and causes the rock to gum up in the mills. If not kept dry, it would be necessary to dry it before milling.

The 6x8 foot tunnel underneath the stock pile is equipped with 30 sliding gates to draw off the rock onto the 18-inch reclamation belt, which carries the rock to a rotary Ehram crusher which reduces it to a 1 inch maximum. The crusher discharges onto another 18-inch belt which carries it up an incline and over the crude ore bin, into which it is discharged by a traveling tripper. This bin has a capacity of 500 tons of rock. It is located in the top of the mill building, which is constructed of timber and into which the bin has been constructed. The side and hoppers



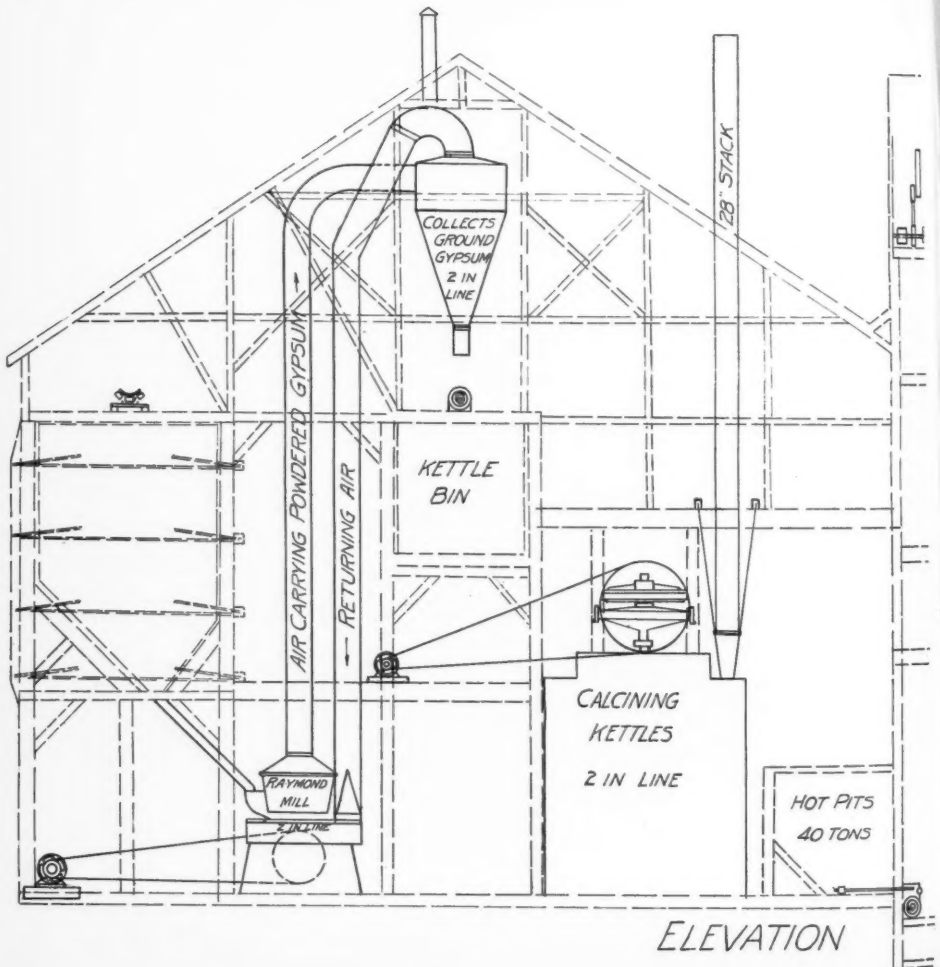
View of Buildings Which Are Now Completed

bottoms of all the bins as well as the floors are constructed of two layers of boards with a layer of tar paper between them.

The rock is drawn by gravity to the feeders on the two Raymond 5 roller mills which pulverize the gypsum. The material is discharged from the mills by means of an exhauster fan and collected in a dust collector located in the top of the building over the kettle bin. The dust collectors discharge into a screw conveyor, which distributes the powdered gypsum along the kettle bin or conveys it over a bridge and discharges it into the land plaster bin. If sold as land

plaster, it is sacked by a Bates packer located under the land plaster bin. The sacked product will be trucked directly into cars or to trucks.

The pulverized gypsum is drawn off from the kettle bins by means of 4 screw conveyors located underneath the bin and discharges into two Ehrsam calcining kettles in pairs. These kettles hold ten tons at a time and are agitated by mechanical agitators during the period of calcination. The heat for calcining is supplied by oil burners using the General Electric centrifugal blower. After the proper amount of water has been driven off, the gypsum is discharged



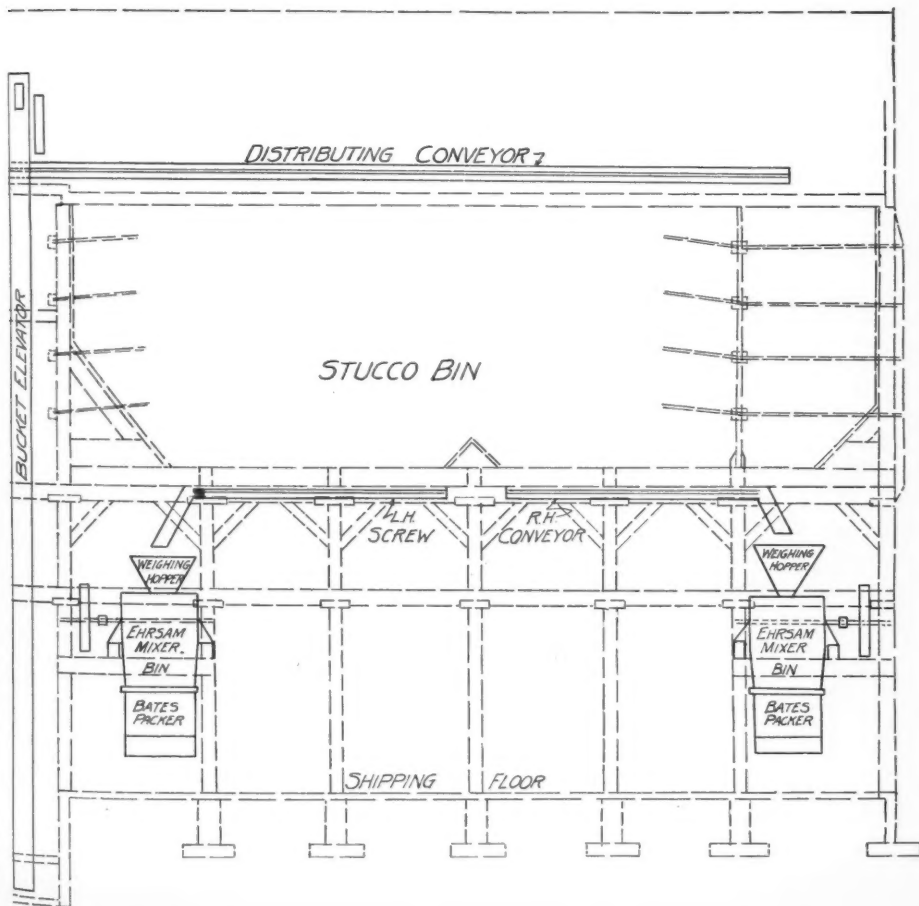
into a hot pit, one for each kettle holding 20 tons each.

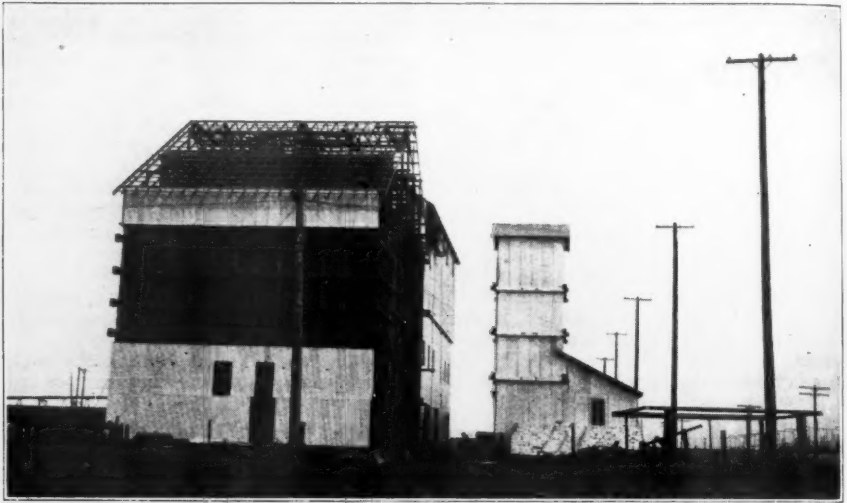
Eight 6-inch screw conveyors located in the bottom of the hot pit discharge the material from the pit into a 12-inch cross screw conveyor, which carries it to a bucket elevator with 10x12 inch buckets. This elevator discharges into a screw conveyor operating along the top of the stucco bin in the top of the stucco building. This conveyor distributes the material along the bin which holds 500 tons of stucco. The stucco bin is hoppers to the center, under which are placed right and left hand screw conveyors that draw off the stucco and carry it to one of the mix-

ers located at either end of the building.

The conveyor discharges into an automatic weighing hopper holding one ton of material. The retarder is added in the right proportions and the mixing is done by a one ton Ehrsam mixer located directly under the weighing hopper. From the mixer it is discharged into a small bin over the Bates packer that sacks it for shipment. Trucks handle the sacks directly into the railroad cars or to trucks at the doorway. Shipments can be made by barge to any city on Puget Sound or by ocean steamer if desired.

Across the track is located the sack receiving room, where they are sorted



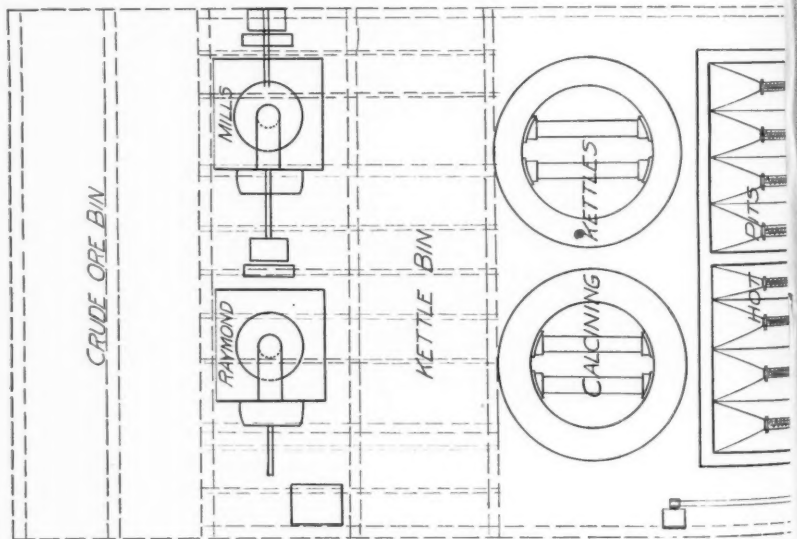


The Buildings Shown Here Have Since Been Completed

and patched. The land plaster bin and packing equipment mentioned above is in this same building.

General Electric electrical equip-

ment is used throughout for operation of the machinery. Link-Belt troughing idlers and gear reducers are in use. The elevators, screw conveyors,



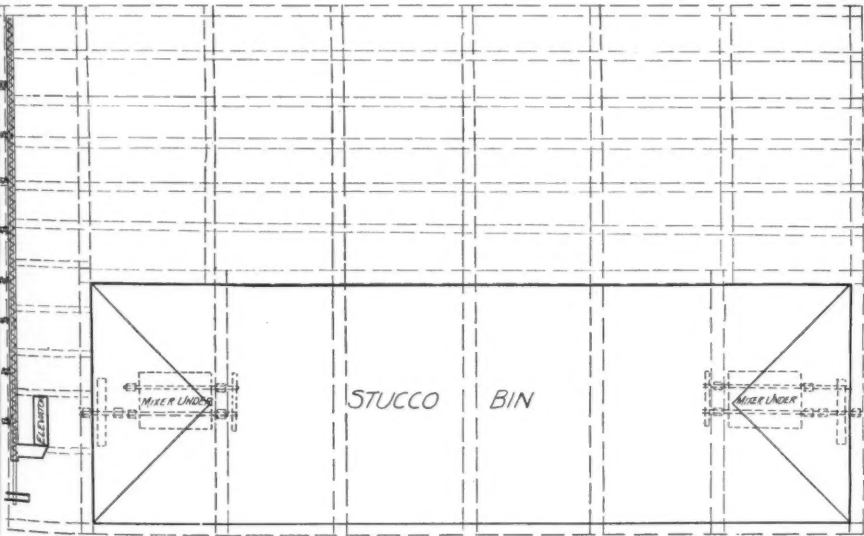


Tunnel Which Will Run Under Stock Pile

crusher, and calcining kettles were furnished by the Ehram Manufacturing Company of Enterprise, Kansas.

Mr. C. O. Bunker will have charge

of the operation of this plant. Mr. Bunker was formerly in charge of the Tacoma plant of the Pacific Coast Gypsum Company, which was taken over by the Standard Gypsum Com-



PLAN

PLASTER MILL
 STANDARD GYPSUM CO. SEATTLE W.N.
 TRACED FROM PLANS PREPARED BY
 H. WINNER, ARCH. & ENGR. SAN FRANCISCO CAL.

AD TRACK

RAILR.

pany and scrapped when this new plant was started.

The Seattle plant will produce 5000 tons of material per month, which will be marketed throughout the North Pacific Coast states. Mr. W. S. Keith, who has offices in the Leary Building in Seattle, is the Northwest manager for the company. Mr. Martin Uldall of San Francisco is secretary of the company. The plant was laid out by Mr. W. C. Ridell, who is in charge of the Long Beach plant of this same company. H. H. Winner, Architects and Engineers of San Francisco, prepared the plans for the buildings and docks. Mr. Guy F. Mason was construction engineer, while Mr. J. C. Hassel installed the machinery.

New Incorporations

Adamant Portland Cement Corporation; capital, \$4,000,000. Incorporators: T. T. Baliss, Mason City, Ia., C. J. Lambert, H. S. Boyes, Signorney, Ia.

California Stucco Products Co., of Philadelphia; capital, \$100,000. (Corporation Service Co.)

Pulverized Minerals Co., Dover, Dell. minerals; capital, \$200,000. Incorporator: E. E. Craig, Dover, Del.

Louisiana Portland Cement Co., Wilmington, Del.; capital, \$10,000,000.

Southern States Mica Co., Dover, Del.; capital, \$1,200,000. Incorporators: C. M. Cooley, S. N. Goodman, Atlanta, Ga., F. Shefner, Chamblee, Ga.

National Gypsum Co., Dover, Del.; gypsum, lime, etc.; capital, \$10,000,000. (U. S. Corporation Co.)

Southern Concrete Products Corporation, Miami, Fla.; capital, \$40,000; limit of indebtedness, \$500,000. Incorporators: C. W. Hayes, C. Ford, A. Logerstrom.

Crescent Tile Co., Trenton, N. J.; capital, \$100,000. Incorporators: S. H. O'Donnell, C. H. Darling, A. Reikosky, Trenton, N. J.

Whitecliffs Corporation, New York, N. Y.; cement; capital, \$3,000,000. (U. S. Corporation Co.)

Ridge Road Graeal and Development Co., Erie, Pa.; capital, \$100,000. Leonard Pasquaalichio, incorporator.

William Brothers Company, metals of all kinds; capital, \$10,000. Martin E. Smith, Wilmington, Del., incorporator.

South River Sand Co., Elizabeth, N. J.; sand, clay, etc.; capital, \$100,000.

North American Cement Corporation, Wilmington, Del.; capital, \$50,000. Incorporators: Arthur W. Britton, George V. Rilly, Robert K. Thistle, New York City.

Arkansas Cement Corporation, Wilmington, Del.; capital, \$6,000,000. Incorporators: Robert K. Thistle, Michael A. Castaldi, George V. Reilly, New York City.

Iron City Sand and Gravel Co., Cumberland, Md.; sand, gravel, cement, building supplies, etc.; capital, \$50,000. Incorporators: James C. Shriver and Eugene J. Kean.

Riverside Sand and Gravel Corporation, Roanoke, Va.; capital, \$5,000 to \$50,000. Incorporators: W. C. Clark, Norfolk, Va., E. L. Lash, Jr., Portsmouth, Va., W. L. Bentley, Jr., Norfolk, Va.

Heney Sand & Gravel Co., Seattle, Wash.; capital, \$100,000. C. P. Bissett, Jr., J. E. Peterson and Robert B. Porterfield, incorporators.

Standard Sand and Gravel Co., Wilmington, Del.; capital, \$250,000. S. L. Mackey, incorporator.

Keystone Foundations, Inc.; cement blocks, bricks, etc.; capital, \$50,000. J. L. Becker, Brooklyn, I. Rosenberg, Bronx, M. Greenberg, Manhattan, incorporators.

The Ideal Sand and Gravel Company, Mt. Healthy, Ohio; capital, \$10,000. Charles Scull, Edward Hine, Raymond Hine, Clinton Yerkes and Anthony Mund, incorporators.

Interstate Products Co., Chicago, Ill.; capital, \$10,000; gypsum products and by-products, etc. Incorporators: Harold F. Smith, W. B. Smith, M. Odger.

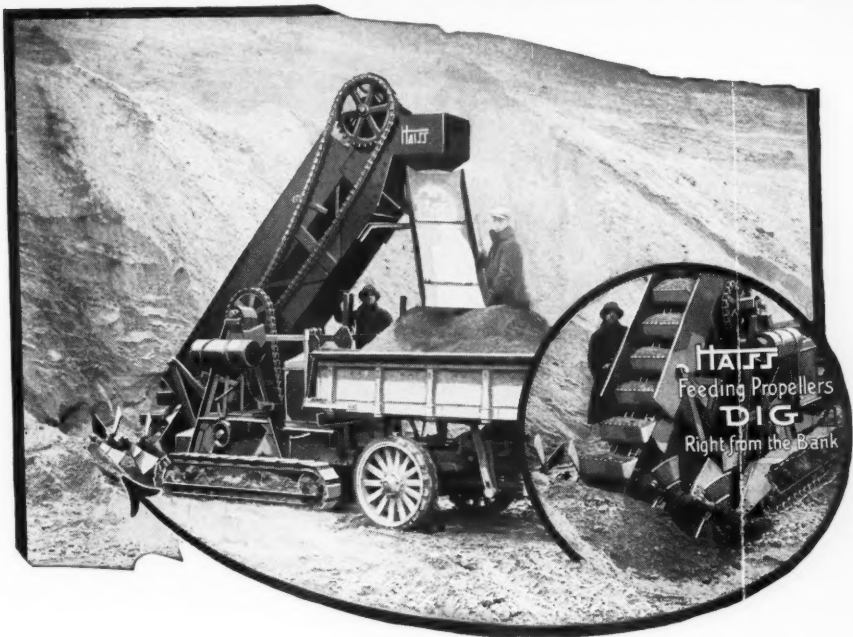
Aurora Gravel Company, Aurora, Ind.; gravel, stone, sand, etc. Cecil C. Shields, Herbert N. Christy, Clarence B. Wilson, E. L. Wilson, Alice G. Wilson, incorporators.

Duchess County Lime and Mfg. Co., Inc.; minerals; capital, \$2,500,000. Michael A. Castaldi, Robert K. Thistle, Raymond J. Gorman, New York City, incorporators.

Olympic Portland Cement Co., Ltd., Seattle, Wash.; capital, \$41,263.91.

Fun Stone and Gravel Co., Shelby, Wis.; capital, \$70,000. Edward A. Funk and E. C. Hinds, incorporators.

Steinberg & Son Stone Co., Inc., Brooklyn, N. Y.; limestone and building material; capital, \$30,000. Samuel and Israel Steinberg, Jennie Mackta, incorporators.



Sure, It Will Pay For Itself

It is self-feeding, digs its way into the bank and feeds the sand and gravel into its buckets.

It is self-crowding—with a slow speed drive that keeps it pushing into the bank so that every bucket digs a full load.

It is mechanically superior—37 H. P. motor, enclosed transmission and clutches running in oil, creeper tread mounting, simple design.

A HAISS Truck Loader is the ideal machine for cutting the cost of loading bank gravel into trucks. It will pay for itself on the small job—getting out 40-50 yards a day, through a 4 or 5 months' season.

You dig right from the bank. Your labor is one machine operator only. You speed up your trucks, make more trips per day, and more profit per trip.

The Haiss Loader is, beyond question, a factor which has made many operations more profitable than ever before. There are hundreds in use—and just as many satisfied users.

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Hauling 300 Tons Per Day



Plymouth 3-Ton Gasoline Locomotive Owned by Vermont Marble Co.
Plymouths are made in 3 to 20 ton sizes, and in

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Gypsum—Quarrying Manufacture and Use

By George O. Gray

PART II

This is the second and last part of a paper by Mr. Gray, which was presented before the Seattle Mining Club of Seattle, Washington, on July 22, 1925. Mr. Gray is assistant sales manager of the Three Forks Portland Cement Company. In the first part Mr. Gray discussed the origin, occurrence, classification, quarrying and mining, and manufacturing of gypsum. In this part of the article the uses of gypsum are discussed.

Editor.

GYPSUM calcined at high temperatures was used as mortar by the ancients and was the common mortar used in Europe at points where it was easily found during the Middle Ages. The same material is still used extensively for mortar in Europe. It is also used for exterior stucco and for flooring in Germany, which market is on the increase. To date no American plants are making this "hydraulic plaster," as it is generally known.

Wall plaster represents the bulk of gypsum manufacture. Stucco is used for temporary construction, mixed with sawdust or shavings, sometimes called "staff," which was used on many World's Fair buildings. Stucco is used by wallboard companies for the manufacture of wallboard. This is unretarded and unfibred at the mill, but is retarded by the wallboard manufacturer, according to the "set" desired, which is based on the maximum strength of the paper backing between which is placed a mixture of gypsum plaster and sawdust at a thickness of one-fourth to three-eighths of an inch. When the paper has reached its maximum stretch, the plaster must start crystallizing as the crystals penetrate the fibres of the paper backing, becoming a part of the paper, so that no glue or binder is necessary, otherwise what is known as "peelers" would result. Wallboard and plaster board are coming into more general use each day. It is an excellent backing for plaster, in which a perfect bond is assured, besides its sound-proof and fire prevention value.

Gypsum block is another product that has many advantages in parti-

tions, as the blocks can be sawed, also reused in remodeling. It has fire-proofing value unequalled by any other commodity. In the East, gypsum is being used, not only being poured between floors, but for roof insulation as a prevention against heat and cold, all of which has been worked out by values. The American Can Company Building of Seattle is the first building in the Northwest to use gypsum for roof insulation. This type of roof is poured into place either by using forms, or with plaster board placed on purlins with reinforcing rods placed throughout the mass. Upon this roof any roofing material can be nailed.

There are a number of patents to recent date covering various types of wall construction by pouring between forms. One of these makes a very porous mass, by using a chemical that causes gas spaces, making the plaster expand three or four times its original bulk, forming enclosed air cells, somewhat like a sponge. It is recommended for insulation and fire-stop between studs and joists for fire protection and sound deadener.

Soundproofing of walls is not due so much to the kind of cementing materials used as to the thickness of the plaster and the voids. It is within reason to proportion sands so that a maximum of voids can be attained to absorb the sound waves, so as to reduce the sound transmitted through the wall, as in apartment houses, hotels, and dwellings. For churches and theaters it is important that very little sound be reflected, but it makes little difference how much is transmitted and a denser wall can be designed.

Plaster is of value as a fire-resistive material only so long as it stays in place. Standard fire, water, and strength tests made by the Underwriters' Laboratories, Inc., and the fire testing station of Columbia University have demonstrated beyond a question of doubt that for equal thickness gypsum will resist high temperatures for greater periods of time than any other commonly used fire resistive material. The destruction of gypsum from fire is due entirely to a slow calcination process which takes place during the period when the

chemically combined water of crystallization is being liberated by heat. The tests referred to have shown that at a temperature of 2200 degrees Fahrenheit it will take four hours to calcine the material to a depth of 3 1-3 inches. Also at the end of this period of four hours the temperature of the gypsum, three inches back, was only 350 degrees Fahrenheit and six inches back was but 208 degrees Fahrenheit, or less than the temperature of boiling water.

The calcination of gypsum is a uniform and slow process and is not attended by undue expansion, warping, buckling and similar contributory causes of destruction. This is due to the fact that while calcination is taking place, the water of hydration is being liberated in the form of steam, and for this reason the gypsum mass that is exposed to fire cannot attain a temperature that is appreciably higher than that of boiling water.

The proper care of plaster in sacks is very essential, as it is hygroscopic by nature and will readily absorb moisture from the atmosphere. As plaster absorbs the moisture, it affects its sand carrying properties and works harder under the trowel, which the plasterer calls "short." This shortness is due to the fact that moisture causes the colloids to stick together into a more or less homogeneous mass, so that when mixed into a mortar, less plaster surfaces are exposed to water attack, which reduces its ability to spread over the sand areas. However, if the plaster is not too "short working" to be applied, it will make a harder wall. The plasterers object very strenuously to short plaster, as it pulls on the shoulder and lowers the yardage per man per day, on account of lack of plasticity.

The manufacture of gypsum plasters is becoming standardized by being made to comply with Bureau of Standard specifications, as well as those of the American Society of Testing Materials. Each factory maintains a chemical laboratory so that continuous tests are made of the rock, setting time of each kettle after calcination, setting time after retarder is added, with and without sand, so that a complete record is on file. On all important work it is within the power of each builder to have tests made by commercial laboratories, certifying as to the quality of the plaster by taking samples from the shipments.

There are many important factors entering into the successful use of gypsum hardwall plasters that I touch on briefly. Water, when fit for human beings, is generally good for plaster mixing. Water used in excess has the tendency of dissolving the plaster colloids, making a watery mass instead of a "fat" plaster. When the proper amount of water is used, it attacks the colloids, forming a gelatinous emulsion on its surface, which is held in place by surface tension, thereby forming an envelope surrounding the particle, so that when external force is applied it will yield easily. The enveloping liquid acts as a lubricant, which is more or less viscous, depending on its concentration. When external suction is applied, it will be found very difficult to reduce the water below a certain amount. Surface tension is a very powerful force, so that it is extremely difficult to withdraw enough water to break the envelopes. The putty, therefore, yields readily to applied force and holds its water strongly against applied suction. These two properties are combined in the meaning of the word plasticity. Of the two, the second is the more important. It is well illustrated by the application of the finish coat to a hardened and partially dry brown coat. The brown coat is continually trying to suck the water out of the plaster to which it is being applied. If it is successful, the plaster may be torn but can no longer be spread, which the plasterer calls "boney."

Proper backing should consist only of the best materials used strictly according to specifications. Plaster board and metal lath have many advantages over wood lath and are well worth the additional cost.

Curing is very essential to secure a hard wall. During the spring, summer, and fall no plaster will make a perfect wall unless all openings are covered, preferably with black building paper, to protect the plaster from being robbed of the necessary amount of water for complete crystallization. Government records during this period show, in Seattle, a relative humidity as low as 11 in the month of April. During the damp, foggy days the plaster should have a circulation of air, as the plaster must dry out after it is set or it will soften. This is called a "sweat out," and sometimes the plasterers claim "that the plaster comes back." At times it is neces-

sary to use a slow drying heat to dry out the walls.

Cracks are not the fault of plaster. Lath cracks are caused by the wood lath not being wetted down before the application of the plaster. Wall and corner cracks are due to faulty construction. Small area checks are from undersanding and drying out.

Price per yard secures high grade walls if good mechanics are hired at a fair figure. The "eggshell" jobs that are being put on today are a crime, and the fault is not with the mechanics but with the builder who insists on paying 50 cents per yard. No wall should be less than $\frac{5}{8}$ inch, better $\frac{3}{4}$ inch or $\frac{7}{8}$ inch. A three coat job insures a better wall than a two coat. If an even, true wall is desired, the wall must have proper "grounds" and be "rodded."

Sand is a subject in itself, and, on account of its importance, I shall discuss it at some length. The American Society of Testing Materials issued a Tentative Specification on Plastering Sand in 1921, as follows:

(a) Sand used for plastering purposes in which gypsum plaster is employed shall be free from salt, and alkaline, organic, or other deleterious substances.

(b) It shall be graded from fine to coarse, and when dry not more than 10 per cent by weight shall be retained on a number 8 sieve; not less than 80 per cent by weight shall be retained on a number 50 sieve; and not more than 6 per cent by weight shall pass a No. 100 sieve. These sieves shall meet the specifications given in the Bureau of Standards Screen Scale.

Using this screen analysis as a basis for experiments, a number of sands, used for wall plastering purposes in the city of Seattle, were tested out by myself under the supervision of the Northwest Testing Laboratories, Seattle, by using different mixes, proportioned by weight of dry material, measured water, and average curing conditions, also noting the effect on setting time.

Two sands were found that came near the A. S. T. M. standard, while several varied, especially on the medium sizes. In order to study the relationship of each sand, the sand was screened through the following sizes: 4-8-14-28-50-100 mesh. Then, according to their granulometric composition, by classifying all the sand

passing a number 4 and retained on a number 50 as coarse, that which passed through the number 50 and retained on a number 100 as medium, and that which passed through the number 100 as fine. This was then plotted out on a triangle chart according to Feret's method. In doing this it was easier to visualize the relationship of each sand to one another, by comparing the coarse, medium, and fine.

We know by actual experiments that fine sands accelerate the setting time in proportion to their relationship to the coarse. Therefore, when one plasterer uses fine sands and another coarse, the setting time might vary as much as one hour. It has been the practice to specify the using of a clean, coarse sand with a mix of one part plaster to two, two and one-half, or three parts sand, by weight, according to the purpose, or to specify by bulk, without taking into consideration screen analysis, or the bulking of sands containing moisture.

The measure of sand as used by the plasterers is a number 2, square pointed shovel. For a 1 to 3 mix, using fifteen shovelfuls of sand. This measure is fairly accurate on coarse grades, provided the sand is damp; but when it becomes dry, the amount of sand per shovel is reduced, as when sand is perfectly dry, not to exceed eleven pounds of sand can be retained on a shovel, or the mix would be about 1 to 1.65 using fifteen shovelfuls. Finer sands show greater bulking effects and less weight per shovel when damp.

The strike box, likewise, has its variations on account of moisture effects, for a cubic foot of coarse dry sand will weigh about 105 pounds, while a cubic foot of sand containing 3 per cent moisture will weigh only about 75 pounds. From the result of tests made on moisture effects on the bulking of sands, I am of the impression that the shovelful measure is the more accurate, provided the "tender" steps up the number of shovelfuls when using drier sands than normal.

The fineness modulus formula, now recommended for concrete mixes to ascertain the value of sand and gravel, varies with the size and gradation of the particles, does not give much importance to the fine particles, but does to the larger. While, on the other hand, the surface modulus theory, which is a number of roughly

proportional to the surface area of the particles of an aggregate, is large for small materials and smaller for coarser ones.

It is my opinion that all proportioning of plaster to sand should be based on screen sizes: 4-8-14-28-50-100 mesh, using the surface modulus formula for its calculation. Then all plastering sands could be classified into possibly three grades to be used under three different proportions to the plaster according to its surface areas; that is, with sands that contain a maximum amount of coarse, with a minimum amount of fines, in proportion to the mediums, giving a plastic mortar, the mix would be possibly one of plaster to three of sand by weight, while with a sand giving a maximum amount of fines to a minimum amount of coarse, with medium amount of fines to a minimum amount of coarse, with mediums in proportion, a mix of one to two would be the limit of sanding. With these two extremes ascertained, a third grade would be worked out, as an average between the two.

To support the surface modulus theory permit me to use as an illustration a cube that measures four inches on each edge, the surface area of each face being 16 square inches, or a total of 96 square inches on all six surfaces. By dividing this cube into eight smaller cubes their edges will measure two inches, with four square inches to each surface and a total of 24 square inches surface area on each of the small cubes, or a grand total of surface area of all eight of the cubes of 192 square inches, which is an increase double the original cube in surface area.

By further subdivision, the areas will continue to increase under the same ratio, so that in grinding the cube into smaller particles so all will just pass through a number 20 mesh screen, we will have 1,813,670 separate pieces, having a combined surface area of 11,707 square inches. Through a number 100 mesh we will have 328,016,728 separate pieces with a combined surface area of 66,207 square inches. By assuming that a cubic foot of rock from which the sand was made is 162 pounds in weight, it is found that with one pound of this rock, ground so as to pass through a number 20 mesh sieve and retained on a number 22, the surface areas total 1,951 square inches; while those

ground to just pass a number 100 will measure 11,035 square inches, or an increase of about six times in the combined surface areas of the 100 mesh over the 20 mesh.

Since the mission of plaster, or any other cementing material, is to bind the sand particles together by complete covering of the surface areas, it is not difficult to conceive from the illustration why a harder wall is made from coarse sands than from fine, and why fine sands will not be bound together as there is not sufficient material to spread around the increased surface areas.

Coarse sands are not always available. Often the mechanic is forced to use a fine sand against his own wishes, yet he will put the same amount of sand to the plaster, not knowing that he should decrease the quantity. His method is to judge the amount of sand to use by the "looks of the mortar," and by the way it feels under the trowel. Again, it is possible to put more yardage per man with a fine sand than coarse, for the trowel slips more easily.

Research work on plaster mixes has accomplished much in the past few years, but a great field is open for further experiments on plastering sands, the importance of which we have just begun to realize fully. It is impossible within the space limits of this paper to cover the subject in detail as to the quarrying, manufacturing, and uses, and might I add the abuses of gypsum hardwall plaster.

Nature has given the world a non-metallic rock whose products are simple in their manufacture for the purpose of making the home beautiful with its protection against heat and cold, fire-proof and sound-proof. Yet man will abuse, some with intent and some not knowing what they do. The problem is ours to correct by bringing the facts to those who care to know the truth.

W. J. Brown has been made Southern sales manager of the Lehigh Portland Cement Co. He succeeds Frank Traynor, who resigned to become general manager of I. E. Schilling & Co., Miami. Mr. Brown made his entry into the cement industry in 1907 as chemist for the United Kansas Portland Cement Co. and was afterwards associated with the Dixie Portland, the Edison Portland, the National Cement and the Georgia Cement and Stone companies.

Manufacturing High Grade Chemical Lime From a Black Fossiliferous Limestone

By F. A. Westbrook

LIME has been shipped out of Glens Falls, New York, for over ninety years. Glens Falls was established in 1763 by Abraham Wing, "the founder" so-called. After helping to survey the town plot at the "Halfway Brook" in 1762, he went there at the head of the Society of Friends the following year, taking up large grants in the immediate vicinity. Originally the settlement was called Wing's Falls. Its name was changed in 1788 to Glenn's Falls in honor of Colonel Johannes Glenn, and finally became Glens Falls.

Its first prominent industry was the production of lumber, which was followed, about 1833, by the establishing of an industry with a product which has since become well known commercially as "Jointa Lime." The first lime sent out of Glens Falls was burned in 1832 in the kilns of Keyes P. Cool, the grandfather of the present Mayor, Honorable Charles W. Cool. The lime industry was later carried on under the name of Cool and Clark until just before the civil war, when Halsey R. Wing and John Keenan formed a partnership under the name of Jointa Lime Company. They continued to manufacture Jointa lime for a number of

years. Later their interest was purchased by the McDonald Brothers and Goodman, and some time after the McDonalds sold out to Charles Fowler. The partnership of Goodman and Fowler continued until the year 1900, when the concern was incorporated under the name of Jointa Lime Company, Inc. In 1902 the F. W. Wait Lime Company was incorporated and took over from the Jointa Lime Company, Inc., all of its high grade black fossiliferous limestone, from which raw material is manufactured the superior quality of high grade chemical lime known as "Jointa Lime," for which during three-quarters of a century Glens Falls has been noted.

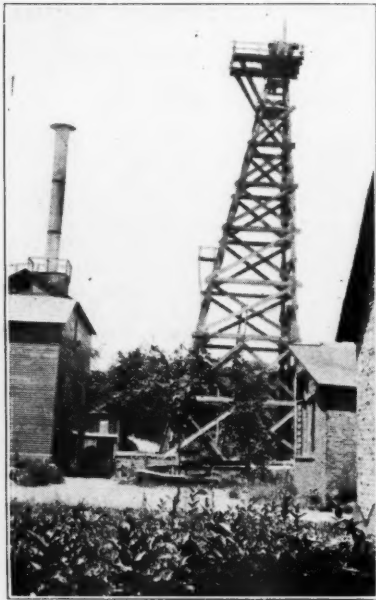
This lime is extensively used by wire mills, chemical works, bleach plants, acid works, ledger and writing paper mills and many other high grade chemical plants requiring a chemical lime free from magnesium, silica, iron oxide and alumina. An average analysis of Jointa Lime is as follows:

Calcium Oxide.....	98.38	per cent
Magnesium	0.50	" "
Silica	0.75	" "
Iron Oxide	0.37	" "
Alumina	0.37	" "

100.00 " "



Boxes Loaded With Stone on Small Flat Cars Which Have Come from the Quarry



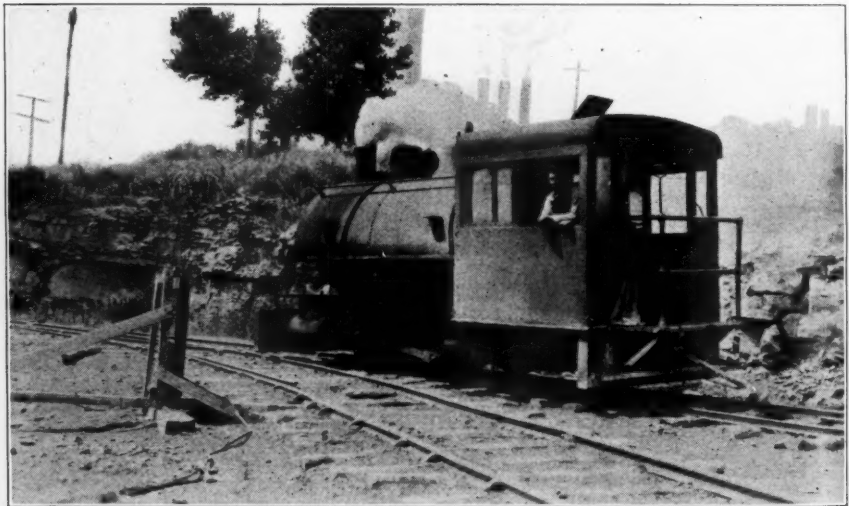
Wooden Tower 107 Feet High for Cableway



Kilns Which Are Fired from Second Floor

The stone is a high calcium black marble and occurs near the surface in shallow beds. As a result there is no hoisting problem, so far as the quarry is concerned. As shown in the illustrations, the narrow gauge tracks leading direct to the kilns enter the

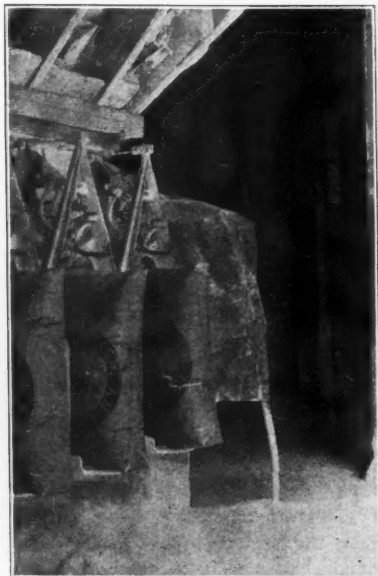
bed of the quarry. These tracks are, of course, moved so as to lead directly up to the point where stone is being quarried in order that cars may be loaded with the least possible effort. The cars are hauled back and forth to the kilns by a small steam locomotive.



Steam Locomotive Engine for Hauling Cars



Broken Stone Stored Along Tracks



The Bates Valve Bag Machine

The kilns are loaded from above, but instead of using an inclined railway, which would take up a good deal of space and cost a good deal to construct, an aerial cableway with a Lidgerwood hoisting engine has been used.

Stone is loaded at the quarry directly into boxes, in so far as practicable, suitable for hoisting on the cableway. There is one of these boxes on each small flat car. The tracks are arranged so that they may be pushed under the cableway and the boxes



Narrow Gauge Tracks Lead from Quarry to Kiln

lifted off. During the charging of the kilns the locomotive shifts the train so as to bring one loaded car after another under the hoisting apparatus. It will be seen that this is a very economical way of charging, as it reduces handling to a minimum and requires no more power for hoisting in this manner than with inclined tracks, in fact probably less because it is not necessary to pull up the cars themselves, which are heavy compared to the boxes.

Blasting has to be done rather cautiously because the quarry is within city limits. It is, therefore, done a little at a time with small charges of 40 per cent dynamite, and as a result of this all of the drilling is done with Denver jack-hammers. Pieces which are too large for burning are broken and loaded into the boxes by hand. The kiln is about one-half mile from the quarry.

The burning equipment consists of 5 Keystone kilns. These are fired from the second floor of the building, which houses them, and they have a cooling cone below into which the burned lime is dropped. They are so arranged that wheelbarrows can be pushed under them and loaded by gravity, or the lime may simply be allowed to fall to the concrete floor, where it is spread out. The layout is shown in the illustrations.

On one side of this building is a

standard gauge railroad siding so that when bulk shipments are to be made, usually to the steel mills, the lime may be wheeled directly into box cars. On the other side of the railroad track is the storage house, into which empty barrels may easily be unloaded from the freight cars or filled barrels loaded onto them when shipments in that form are to be made. At the end of these tracks beyond both buildings is a large pit for the storage of coal, which may be dumped from the cars.

A good deal of hydrated lime is furnished to the paper manufacturing industry. The hydrating machinery, which is a Kritzer hydrator, is located at one end of the row of kilns. The bulk lime as it comes from the kilns must, of course, be crushed before it can be hydrated. The Sturtevant lime crusher is located below the floor on which the lime is drawn from the kilns, so that it is a simple matter to wheel the bulk lime a short distance to a trap door in the floor and drop it into the crusher. The crushed material is carried by a conveyor to a storage tank at the top of the building. It is then allowed to drop, as desired, into a pit, where it is picked up by an elevator and carried to the top of a Kritzer hydrator. It next passes down through the six cylinders of the hydrator and is taken by a screw conveyor to the Raymond separator, which whips it out to the desired fineness



Narrow Gauge Tracks Leading to Quarry at Right and to Mill at Left

(200 or 300 mesh) by suction. The finished, hydrated lime then drops into the bin above the Bates bag machine.

The bagging machine is located on the side of the building adjacent to the tracks. It is thus very easy to load the bags directly onto the freight cars as they are filled, or, if they are for stock, a plank is laid over the tracks across the space between the manufacturing building and the store house and the bags carried to the latter on hand trucks. Of course all of the machinery is electrically operated.

The output of this plant is from 60 to 75 tons of lime per day. It is not the largest lime plant by any means, but it is about the largest high grade chemical lime plant in the country and the only one in the United States using a black marble. It is a striking fact that this black stone becomes, after burning, lime of the purest white.

The highest grade Westmoreland gas coal is used in the proportion of about 1 to 3. As the finished product is distinctly a quality product it commands a corresponding price. Nevertheless, as will be realized from the foregoing description of the plant, all practicable means have been taken to place its production on a highly efficient basis. Mr. H. T. Russel, the president and general manager of the company, has been in the business for thirty years or more and is too keen a business man not to realize that inefficiency, no

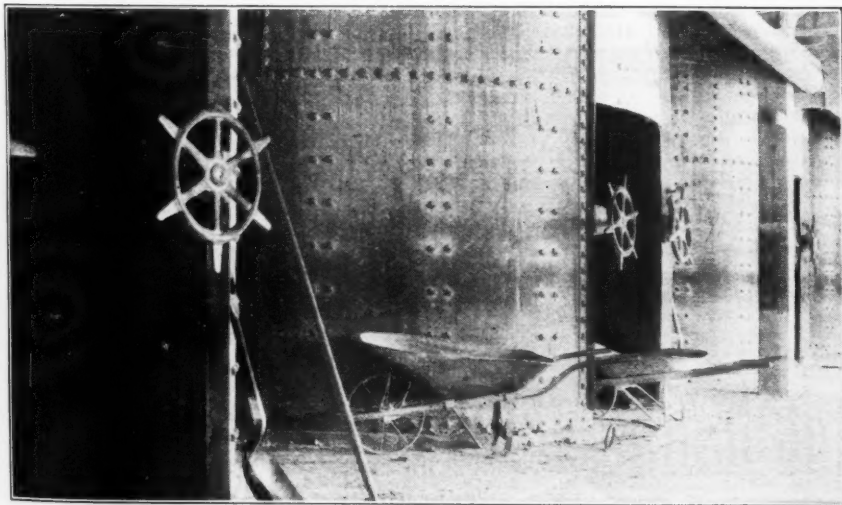
matter what the conditions under which any commercial enterprise is carried on, is sure to result fatally sooner or later.

A very practical precaution which Mr. Russel has taken to guard against interferences with production has been to accumulate large quantities of stone in suitable sizes for the kilns along both sides of the narrow gauge tracks leading to the quarry. This is desirable because it is sometimes impossible to work the quarries on account of spring freshets and other causes which cannot be controlled.

Uehling Appoints

The Uehling Instrument Co., Paterson, N. J., have recently appointed two new southern agents to handle their line of CO₂ recorders and other power plant instruments, namely John C. Candler, 315 Glenn Bldg., Atlanta, Georgia, to cover, Georgia, Eastern Tennessee and the southern half of South Carolina, and Charles M. Setzer of Charlotte, N. C. to cover North Carolina and the northern half of South Carolina.

Mr. Zimmer entered the employ of The Linde Company nine years ago as Junior Salesman, and has steadily risen in rank. Most of the time he has represented the company in the Central West, coming to New York early in 1924 to act as Assistant General Sales Manager.



Rows of Kilns on Ground Floor Where Access Is Had to Cooling Cones

Distribution of Cement

The following figures show shipments from Portland cement mills distributed among the States to which cement was shipped during May and June, 1924 and 1925.

Portland cement shipped from mills into States, in May and June, 1924 and 1925, in barrels. a

Shipped to	Year	January 1925	February 1925	March 1925	April 1925	May 1925	June 1925	July 1925	1924	1925
Alabama.....	1,871,885	85,410	103,513	177,510	191,541	185,314	214,195	212,720	256,741	
Alaska.....	6,304	132	0	294	709	0	1,284	1,432	2,816	
Arizona.....	389,935	34,370	25,945	27,009	31,264	32,749	32,451	30,474	37,842	
Arkansas.....	1,079,304	41,376	44,352	72,198	94,695	87,340	92,101	129,334	78,059	
California.....	10,772,733	988,883	753,123	1,029,118	1,027,945	1,081,945	1,066,088	942,273	1,061,048	
Colorado.....	1,344,493	42,425	69,871	102,537	131,363	172,202	170,818	161,005	118,272	
Connecticut.....	1,576,021	34,810	50,026	113,668	160,616	177,292	172,564	192,957	176,644	
Delaware.....	384,228	5,786	9,444	21,766	41,573	28,892	37,330	46,078	43,376	
District of Columbia.....	718,146	37,285	65,176	58,474	70,765	103,996	81,334	79,851	82,133	
Florida.....	2,155,836	265,463	227,811	272,094	261,180	313,846	348,330	473,184	341,849	
Georgia.....	1,406,476	93,062	98,569	140,634	112,545	127,548	107,824	107,824	132,050	
Hawaii.....	40,587	417	0	1,500	2,250	5,608	6,108	5,481	5,993	
Idaho.....	262,142	2,598	11,029	17,667	28,393	28,613	28,122	23,922	28,498	
Illinois.....	13,309,655	463,388	378,947	846,638	1,467,815	1,790,601	1,636,379	1,533,330	1,853,734	
Indiana.....	5,492,150	139,782	143,464	255,597	433,996	569,436	617,360	744,692	658,042	
Iowa.....	3,138,347	53,044	52,039	161,164	284,477	346,484	310,558	401,855	327,155	
Kansas.....	2,128,898	33,588	120,405	212,402	232,220	242,880	232,522	199,437	226,787	
Kentucky.....	1,727,038	52,013	68,970	115,222	174,795	195,351	231,491	188,068	229,652	
Louisiana.....	1,255,952	75,992	97,638	98,193	108,285	99,402	100,016	109,385	99,111	
Maine.....	386,092	4,837	5,238	21,702	36,163	38,435	43,541	50,045	41,475	
Maryland.....	1,983,993	47,635	98,231	143,291	207,844	231,935	249,105	218,371	247,835	
Massachusetts.....	3,352,294	113,101	134,541	257,381	344,406	374,243	350,620	388,173	386,058	
Michigan.....	9,335,798	190,905	248,240	437,712	859,815	1,140,027	1,264,462	1,205,309	1,229,598	
Minnesota.....	3,238,161	59,395	97,034	173,618	321,854	425,473	409,235	405,863	436,453	
Mississippi.....	507,201	29,867	28,564	35,778	48,174	47,573	66,012	41,506	67,446	
Missouri.....	3,929,248	115,141	162,992	379,157	489,316	652,330	583,561	427,101	683,097	
Montana.....	202,541	5,334	6,093	16,450	23,030	28,170	28,985	20,985	31,486	
Nebraska.....	1,496,892	31,832	46,281	99,780	180,951	198,338	181,516	158,955	203,863	
Nevada.....	90,949	2,492	5,177	7,254	10,767	11,676	10,784	8,806	10,068	
New Hampshire.....	377,917	9,419	15,911	27,592	39,906	36,814	40,837	41,240	41,843	
New Jersey.....	6,345,124	157,612	243,534	498,227	722,751	721,605	737,572	738,895	760,944	
New Mexico.....	236,644	7,911	10,320	18,865	19,699	17,141	18,406	22,007	16,323	
New York.....	17,282,302	400,896	587,674	1,159,830	1,717,441	2,028,808	2,090,644	2,041,145	2,170,960	
North Carolina.....	2,846,808	79,817	128,770	200,097	277,616	289,056	324,201	259,730	343,683	
North Dakota.....	270,354	1,380	3,742	16,589	37,937	47,789	66,089	72,154	55,305	
Ohio.....	9,201,578	259,628	271,075	592,069	894,683	1,054,230	1,099,767	1,211,851	1,099,016	
Oklahoma.....	2,201,699	58,872	155,083	203,161	201,886	235,096	225,879	177,823	225,729	
Oregon.....	1,205,672	54,117	60,816	103,813	101,661	129,048	134,036	140,656	143,672	
Pennsylvania.....	12,950,829	288,916	421,519	808,636	1,250,501	1,482,560	1,869,299	1,580,596	1,869,377	
Porto Rico.....	6,686	0	0	0	0	0	0	0	0	
Rhode Island.....	612,344	15,668	17,908	54,083	79,063	72,914	89,213	60,649	75,383	
South Carolina.....	472,154	46,840	73,313	72,929	65,806	74,198	85,087	42,238	75,376	
South Dakota.....	472,154	4,331	13,528	40,697	57,039	66,445	59,120	70,244	55,847	
Tennessee.....	1,990,992	69,669	87,499	116,856	133,037	163,812	185,536	148,173	208,562	
Texas.....	3,844,187	260,540	345,057	881,320	401,517	373,605	411,795	388,590	418,401	
Utah.....	429,630	16,821	16,821	28,567	33,469	41,447	37,733	55,413	38,975	
Vermont.....	337,146	3,129	3,060	10,312	25,353	24,178	26,978	35,469	26,245	
Virginia.....	1,685,953	54,445	95,942	132,891	160,139	164,167	172,760	156,644	180,025	
Washington.....	1,831,348	85,969	90,669	151,814	180,845	265,735	328,589	179,521	334,466	
West Virginia.....	1,663,250	45,912	56,629	85,703	134,572	140,992	161,484	226,563	164,874	
Wisconsin.....	4,357,044	113,396	73,320	142,620	358,379	507,654	569,687	586,677	562,363	
Wyoming.....	328,221	3,492	9,181	16,358	19,981	32,466	31,290	47,769	25,691	
Unspecified.....	684,598	15,964	26,430	46,236	34,875	3,996	3,996	66,488	68,647	
Foreign countries.....	144,927,151	5,092,090	5,961,563	10,205,073	14,327,067	16,659,016	17,417,489	16,558,921	18,033,472	
Total shipped from cement plants.....	145,747,000	5,162,000	6,015,000	10,279,000	14,394,000	16,735,000	17,501,000	16,614,000	18,131,000	

a Includes estimated distribution of shipments from three plants for May and June, 1924; and from four plants for May and June, 1925.

Stone That You Can Mould

By Chester N. Reitze

Part II

This is the second and last part of an interesting treatment of cement manufacture. This subject was presented by Mr. Reitze before the Seattle Mining Club on August 5, 1925, at Seattle, Washington. Mr. Reitze is assistant general manager of the Portland Cement Association at Seattle. In the first part of this article, which appeared in the September 15th number of Pit and Quarry, Mr. Reitze discussed briefly the development of the cement industry and the raw material requirements.—Editor.

PORTLAND cement, as mentioned in the last article, is the properly proportioned mixture of certain substances. To secure sufficient mixing, it is necessary that these materials be ground to a powder finer than flour. But the mere mixing of the various ingredients is not sufficient to produce a material that will answer the requirements of a good cement. The elements must combine chemically. Hence the manufacture of portland cement can conveniently be divided into three distinct stages: first, the raw materials must be properly proportioned and intimately mixed; second, this mixture must be heated to a high temperature to provide the chemical combination; and last, this resulting clinker must be ground to impalpability, the portland cement of commerce. The three stages have become more or less standardized and vary only in the mechanical details in the various plants. In the first, however, there are two distinct roads of approach, called the wet and the dry processes.

Coming from the quarry the limestone is deposited in a giant crusher. This crusher reduces the rock to a size such that the largest piece will pass a ring six inches in diameter. The yawning mouth of this great machine seems to swallow the rock and return it through hidden channels to the earth from which it came. Yet the riddle is easy to solve. Down underneath this bulk of iron comes a steady stream of different appearing material. It is the stone which a short while ago was a part of that mountain in the quarry. Again it is swallowed from view and once more

it returns in still smaller sizes, two inches, perhaps, in diameter. And from here it goes to great storage piles, to convert the spasmodic supply of the quarry into the constant stream of materials demanded by the plant.

As the materials leave the storage piles in the wet process plant, sufficient water is added so that the grinding and pulverizing are done while the materials are in a fluid state. The thick, creamy substance resulting is known as slurry. Mechanical agitators are necessary in the huge slurry tanks to prevent settling and to maintain uniformity in the mixture.

Conversely, in the dry process the latent moisture of the materials must be removed if they are to be pulverized efficiently. Mechanical conveyors carry the materials into large rotating steel cylinders where hot gases drive out the moisture. Thoroughly dried, the two substances are next to be proportioned. Previous tests have determined the necessary amounts of each material, and automatic machines carefully weigh out the predetermined quantities.

Properly proportioned, the substance is now ready for grinding. Like most industries as complex as cement making, many and varied devices have been introduced for the mechanical details. But as a typical example there is the hammer mill where the constant stream of rock is reduced to particles the size of sand.

Particles the size of sand are not sufficiently small to secure the association that is necessary previous to the chemical combination and so the sand is carried to another machine for pulverizing. This time the tube mills may be used. These mills are large steel cylinders. They are partially filled with small steel balls—in one mill there may be as many as 30 to 40 tons, an average freight car load,—and in the continuous rotation they form a cataract of steel which reduces the clinker to a powder so fine the eye cannot detect the separate particles. That mountain has shrunk to impalpability.

Such machinery, however, is essentially a later day application. When the industry was first introduced into

Foreign countries..... 91,322
 Total shipped from cement plants..... 55,079
 16,614,000
 18,131,000
 17,501,000
 16,735,000
 14,394,000
 10,279,000
 6,015,000
 5,162,000
 145,747,000
 819,349
 69,910
 53,437
 73,927
 86,933
 75,984
 85,511

this country, makeshift devices were all that the manufacturer had. It was impractical to reduce the raw materials or the finished product to the fineness which the industry now demands. Old millstones, resembling in appearance the maize grinders of early colonial days, were the only means of grinding. In the pulverizing machines of the modern plant there is produced a powder so fine that about 85 per cent will pass through a sieve which will hold water, a sieve, finer than silk dress goods, with 40,000 openings to a square inch.

Now the materials are ready for the second stage of manufacture, that of chemical and physical combination. Automatically conveyed to the upper end of a huge rotary kiln, they start on a two or three hour journey through a temperature hotter by 200 degrees Fahrenheit than that required to melt steel.

In the early nineties practically all of the country's output was made in the vertical type of kiln, a crude affair, burning coke and turning out perhaps as much as a hundred barrels of clinker a day. In the modern mill these antiquated kilns have been replaced by giant, brick-lined steel cylinders burning powdered coal, fuel oil or natural gas. Some of the more recent installations are as long as five freight cars; in operation they weigh as much as ten steel Pullmans; and they produce perhaps 2,000 barrels of white-hot clinker every twenty-four hours. In doing this a ton of powdered coal or equivalent oil or gas would be consumed every twelve to fifteen minutes.

It is in the rotary kiln that the raw materials are converted into a new substance. Under the heat of 2,500 to 3,000 degrees Fahrenheit, the tiny particles of the previously unrelated substances are combined into a new material, a material of new physical and chemical properties known to the manufacturer as clinker, but actually nothing more than portland cement before the final grinding.

These kilns are set at a slight inclination, and by the slow, constant rotation the material cascades down the ever lifting sides as it slowly flows throughout the length of the great cylinder. Electric motors, operating through a series of reduction gears, are necessary to rotate the kilns. It is to ensure the free working of such massive movable struc-

tures that the industry last year consumed some 41,000,000 pounds of lubricants.

To protect the steel shell from the excessive heat, it is lined with nine-inch fire brick. But even this fire brick is so eroded in a few months that it must be replaced. Last year 5,800,000 bricks were used in relining cement kilns.

At the lower end, beneath the pipe that carries the powdered coal (coal blown like gas through a pipe line), there emerges a continual stream of clinker still white-hot. In order to reduce its temperature for handling, it is passed through a rotary cooler, resembling in miniature the rotary kiln from which it just came. The clinker is then conveyed to storage. This new substance is impervious to the elements, and hence provides the manufacturer an opportunity to accumulate a reserve in times of little demand.

The final stage in the manufacture of portland cement is the grinding of the clinker into the fine powder familiar to the consumer. This is accomplished in much the same way that the raw materials were ground and pulverized previous to the chemical combination. The glass-hard clinker is reduced to the consistency of sand in various types of mills. For instance, there is the centrifugal mill. In these centrifugal grinders the material is crushed by rollers pressed by centrifugal force against an iron ring.

Before the clinker enters the tube mills for final pulverizing, a small amount of gypsum, not to exceed 3 per cent, is added. This gypsum serves to retard the rate of setting when the cement is used in concrete so that it will not harden too rapidly. The cement industry added to the prosperity of the gypsum business by consuming some 775,000 tons last year.

The finished product is now ready to be stored in huge bins until it is bagged for shipment. Automatic machines have been perfected to replace the old scoop and shovel methods of the early days. With one of these machines an operator can fill about 500 sacks an hour. The machine is so adjusted that exactly 94 pounds, a cubic foot, of cement goes into every bag. After the empty sack is tied on an automatic machine, it is filled through a valve in the bottom. Last year some 56,000 miles of wire were

used to tie the sacks in which the output of cement was shipped.

Enough cement was produced during the past year to fill some 600,000,000 bags. To provide sufficient containers the cement companies must maintain some 240,000,000 bags in service. Of the \$450,000,000 estimated investment in the cement business, \$45,000,000 is invested in cloth sacks alone. It has been estimated that one in eight of the bags used for shipment fails to return to the manufacturer in spite of the refund that is offered. To replace that number, some 65,000,000 last year, a strip of cloth 30 inches wide would have to be 36,000 miles long, enough to keep 3,400 looms busy every day for a year and to require 65,000 bales of cotton. No small part of the modern plant is devoted to maintaining a ready supply of serviceable bags by sorting, cleaning and repairing those that are returned. Nineteen million pounds of paper were required in 1924 to make the 50,000,000 non-returnable bags used in the cement industry.

There are few manufactured materials which cause such wear and tear on machinery as does the making of cement. Depreciation is rapid. Grinding and pulverizing such large quantities of hard rock and harder clinker erode the wearing surfaces. Complete blacksmith and repair shops are vital to the efficient maintenance of every plant. As much as a tenth of the total plant valuation may be invested in spare parts in order to reduce costly shutdowns to a minimum. One out of every five men working in a cement plant is a member of the repair force. Last year the industry had to replace 2,000,000 lineal feet of belting.

Throughout the process of manufacture, close watch is kept of the physical and chemical properties of the cement. Every plant maintains well equipped laboratories. As the cement is borne to the storage bins after the final grinding, samples are collected, which are subjected to eleven different physical and chemical tests. That particular batch of cement must meet the standard rigid requirements, and so it is with the 28,000,000 tons produced annually.

The distribution of this vast amount of material is an important item to the railroads, which transport about 85 per cent of the output. With the incoming coal, equipment and material, which is sufficient to represent

nearly 3 per cent of the entire freight tonnage of all the railroads in the United States, there are some 8,000 items on the list of commodities carried. The motor truck also comes in for its share of the haulage, and with the increase in the concrete road mileage this means of transportation is constantly growing in favor.

In all of these operations in the manufacture of portland cement from the quarry to the finished product, great quantities of power are required. As a whole the industry is rated as the tenth largest consumer of power in the United States. A generating station capable of furnishing the lights and power for a community of 150,000 inhabitants is necessary for one of the largest plants. Practically every one of the many and varied machines in the modern plant is individually operated by electric motors. Batteries of huge motors working through magnetic clutches turn the finishing mills.

It is easy to imagine the great quantities of fuel which are necessary to supply the excessive temperatures in the rotary kilns. Yet this represents but about two-thirds of the entire fuel demands. Of the 137 operating plants included in a recent report of the United States Geological Survey, 118 used pulverized coal either alone or in combination with oil or gas, while 18 used fuel oil alone, and one used natural gas. This coal as purchased from the mine must be pulverized as fine as the finished product, and here again we meet that oft mentioned sieve. The cement manufacturer is rated as the fourth largest manufacturing customer of the bituminous trade. Last year on his coal bill there were itemized some 11,000,000 tons. To maintain uninterrupted production the cement manufacturer keeps a careful eye on his supply of coal. Strikes, railroad delays, a dozen different reasons prompt him to keep well provided in advance.

There is also the manufacturer who uses oil in his kilns. He must be as sure of an uninterrupted fuel supply as the coal consumer. Although fewer than 20 plants use fuel oil exclusively in the kilns, last year some 5,000,000 barrels were consumed, an average per plant of several tank car loads every working day.

To promote the correct utilization of their product, the majority of the cement manufacturers in this country

and Canada, as well as several in Mexico and South America, jointly support the Portland Cement Association. This organization in connection with Lewis Institute, Chicago, maintains extensive laboratories for the investigation and improvement of the various details connected with cement and concrete. To bring concrete to the highest possible perfection huge testing machines have been installed. Thousands of tests are made annually on different kinds of concrete in which different aggregates, various amounts of water, and various quantities of cement have been used. The effort is to give the smallest user as well as the largest contractor the latest and most reliable information that will improve the quality of his work.

We have seen in a general way the details in manufacturing portland cement. We have heard astounding figures of the quantities produced. We have stretched our imaginations to visualize a few of the uses of this product, but there are many more.

Freight Car Loadings

Loading of revenue freight for the week ended September 12 totaled 975,434 cars, according to reports filed by the carriers with the car service division of the American Railway Association.

Owing to the observance of Labor Day, it was a decrease of 127,512 cars under the week before with decreases, compared with the preceding week, in the loading of all commodities. Compared with the corresponding week last year, the total for the week of September 12 was a decrease of 86,347 cars and a decrease of 85,129 cars under the corresponding week in 1923.

Miscellaneous freight loading totaled 376,151 cars, a decrease of 48,909 cars under the week before and 17,544 cars under the same week last year.

Loading of merchandise and less than carload freight amounted to 38,035 cars, a decrease of 30,957 cars under the week before and 16,270 cars under the same week last year.

Coal loadings totaled 157,357 cars, a decrease of 0,861 cars under the week before and 25,443 cars under the same week last year.

Grain and grain products loading amounted to 44,690 cars, 11,041 cars below the week before and 21,539 cars under the same week last year.

Live stock loading for the week amounted to 28,687 cars, a decrease of 3,525 cars below the week before and 10,107 cars below the corresponding week last year as well as 10,373 cars under the same week two years ago.

Forest products loading totaled 64,764 cars, 6,895 cars below the week before and 5,069 cars below last year as well as 10,222 cars below the same week two years ago.

Ore loading totaled 54,771 cars, a decrease of 4,994 cars below the preceding week, but 6,941 cars above last year. It was, however, a decrease of 21,884 cars under the same period two years ago.

A comparison by weeks follows:

	1925	1924	1923
Sept. 12	975,434	1,061,781	1,060,563
Sept. 5	1,102,946	.....	.....
Aug. 29	1,124,436	1,020,809	1,092,150
Aug. 22	1,080,107	982,700	1,069,915
Aug. 15	1,064,793	1,019,077	1,062,993
Aug. 8	1,051,611	941,407	978,750
Aug. 1	1,043,063	945,613	1,033,466
July 25	1,029,603	926,309	1,041,415
July 18	1,010,970	990,230	1,001,350
July 11	982,809	909,973	1,019,800
July 4	864,452	757,904	850,082
June 27	901,341	908,251	1,021,471
June 20	982,600	803,546	1,005,432
June 13	987,106	902,592	1,008,838
June 6	994,874	910,793	1,012,312
May 30	920,514	986,209	820,551
May 23	986,209	918,214	1,015,532
May 16	984,916	913,201	992,319
May 9	981,370	908,213	984,078
May 2	981,711	913,550	961,617
April 25	959,225	878,387	962,578
April 18	922,778	876,916	970,042
April 11	917,284	880,937	945,271
April 4	922,375	961,990	896,375
March 28	931,395	907,389	896,735
March 21	909,363	908,290	916,818
March 14	924,149	916,762	904,116
March 7	930,009	929,381	905,344
Feb. 28	862,910	944,544	916,624
Feb. 21	925,295	945,679	830,187
Feb. 14	902,877	935,589	816,646
Feb. 7	928,244	906,017	849,352
Jan. 31	896,055	929,623	865,314
Jan. 24	924,254	894,481	896,464
Jan. 17	932,150	894,851	864,297
Jan. 10	932,807	872,023	873,908
Jan. 3	765,727	706,292	727,246

Stope Method In Quarry Reduces Costs For Oregon Portland Cement Company

By E. D. Roberts

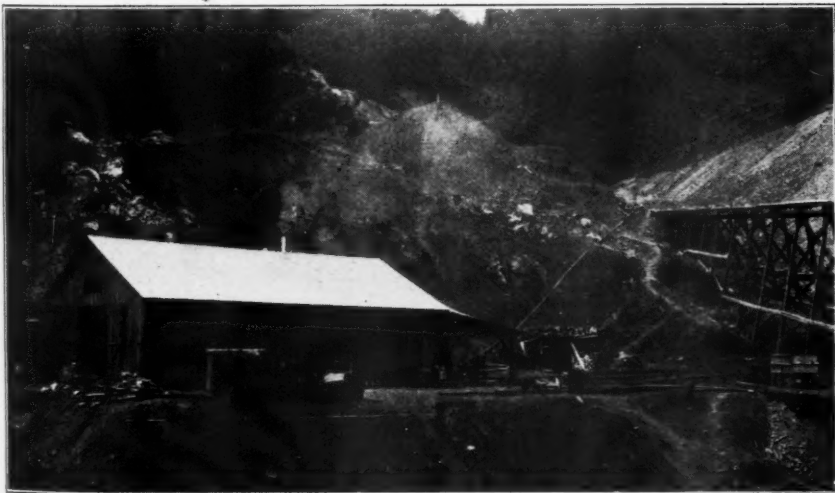
FOLLOWING out the policy of reducing the cost of operation wherever possible, the Oregon Portland Cement Company has started to operate its lime rock quarry by the stope or glory hole method which is effecting a saving of nearly 50 per cent in the cost of quarrying lime rock. The Oregon Portland Cement Company, whose plant is at Oswego, Oregon, secures its rock from two sources namely, high lime rock from the Roseburg quarry, and cement rock from the Dallas quarry, and mixes it in the proper proportions to secure the desired slurry.

Heretofore, the Roseburg quarry was operated under the contract system although the Company owned the quarry and plant. It was deemed advisable to take over the operation of the quarry themselves and to make certain changes to reduce the cost of the lime rock. Accordingly, a contract was let to Grant Smith and Company to drive a tunnel to tap the ledge 100 feet below the present floor of the quarry with an inclined shaft from the quarry floor to intercept the tunnel at a point 530 feet from the opening. Work was started

in March of this year, and the tunnel completed, together with 200 feet of additional development tunnel, a machine shop, new bins and a trestle for the filling of it by gravity, by July first. Mr. F. S. Baillie, General Manager for Grant Smith and Company, supervised the construction work, and Mr. Axel Carlson was Superintendent for the contractors, while Mr. A. R. Moore, who planned the new installation, looked after the interests of the Cement Company during the construction period.

Previously, the rock was mined in an open pit by blasting and hand loading into 1½ yard cars which were handled to the dumping place where a 4 yard car underneath received the rock. A gravity plane carried it to the loading bunkers where it was end dumped into them and drawn off into a train of 3 cars, each one under a gate, by means of a hand ratchet gate. From this point on the operation will continue for a time without change and will be described later in the article.

Blasting the rock from the sides of the hole by 5 to 10 foot breast drills causes the rock to fall to the pile



Machine Shop—Tunnel Opening In Center—Trestle for Old Tram at Right



Train of Cars Over Loading Bins

below. If too large to handle, the size is reduced by bulldozing. A vertical sliding hand operated ratchet gate controls the flow of the rock into the mine cars on the track below. These cars are of steel construction and dump from the side, after being hauled to the rock bins by a 4 ton Jeffrey electric locomotive obtaining its electricity from a storage battery which it carries.

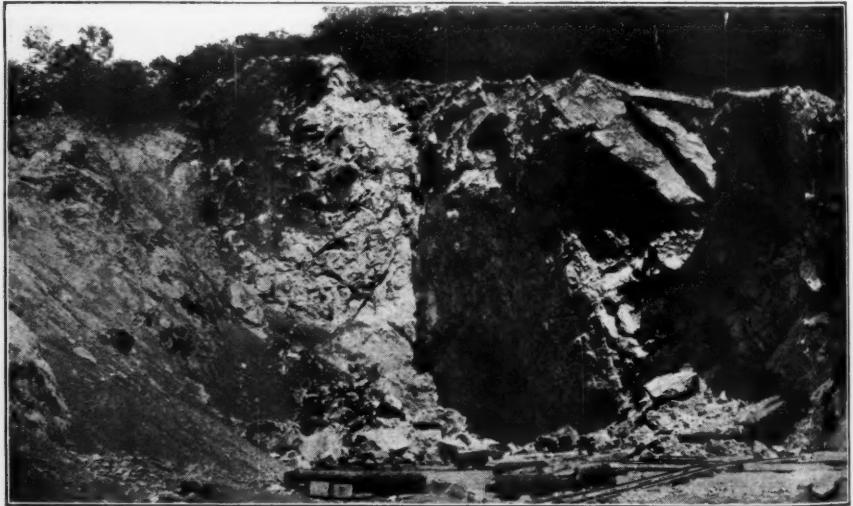
Two storage batteries have been provided so that one can be charging while the other is in use, thus providing for continuous operation of the locomotive. Electricity for charging is furnished by a 65 ampere, 120 volt Westinghouse generator driven by a Fairbanks Morse gasoline engine. Electricity for lighting the mine and camp is also furnished by this layout. A steel I beam over the charging room furnishes the track for an overhead rolling Yale and Towne Triplex block which lifts off a battery from the car and replaces it with the other.

The Roseburg Quarry

In the Roseburg quarry two Ingersoll Rand 9x8 compressors furnish compressed air for operation of the drills and the air to operate a Worthington piston pump to de-water the tunnel. This water is led into 2 large tanks for use around the plant. The water thus obtained is slightly more than enough to meet requirements. The compressors are driven independently by 25 H.P. Fairbanks Morse Diesel engines. As only one is required at a time, the other is a standby.

A Garden City fan was used for ventilating the tunnel during the time of construction. This fan will be kept for use in case operating conditions require it. Power for its operation is furnished by a 3 H.P. Fairbanks Morse gasoline engine.

The new bins are of wood construc-



The Present Roseburg Quarry

tion with a capacity of 900 tons in the three bins. Steel has been used for lining the hopped bottoms. The new bins are constructed alongside the track leading to the old bins with three ratchet gates for drawing the rock off into the cars. The Link-Belt Company manufactured the gates.

Two trains of 3 yard Western side dump cars transport the rock to and dump it into the lower bin from which it is drawn off into standard gauge railroad cars. These side dump cars are fastened to a cable so that the loads pull back the empties. Not enough difference in height between the loading point and the tippie is secured to operate the train wholly by gravity. Consequently a Mundy steam driven hoist provides the power to pull the cars the last 200 feet to the point over the bins where they are dumped. A 25 H.P. Erie boiler furnishes the steam to operate the hoist as well as to operate a Fairbanks Morse piston steam pump pumping water into an overhead tank for use in the standard gauge dinkey. This dinkey handles the empty railroad cars from Carns on the Southern Pacific Railroad, 5 miles up a branch standard gauge railroad owned and operated by the Cement Company. After spotting for loading, it handles the loads back to the main line for hauling to Oswego by the Southern Pacific Railroad, a distance of nearly 200 miles. The boiler also furnishes steam for operating a Knowles steam pump



End View of Loading Bunkers

which pumps fuel oil from tank cars into storage tanks and from storage tanks to the storage tank of the engine. The work is so arranged that the loading crew operates the tram half a day and the railroad the other half.

Future developments are planned which will further reduce the cost of operation. One is to drive a new tunnel on a level which will allow the mine cars to dump directly into the lower storage bin, eliminating the up-



The New Bunkers at Left and the Old Bunkers at Right in the Roseburg Quarry



Airplane View of Oregon Portland Cement Company's Plant. Note Employees' Club House, Tennis Courts and Baseball Diamond in the Foreground



View of New Dallas Quarry—Stone Is Hand Picked and Loaded Into Dump Cars

per bins and operation of the inclined tramway.

The old bins and tracks will be kept in place for the present to serve as a standby in case of trouble in the tunnel which might stop the output of rock for a time.

The quarry will be operated under the supervision of Mr. A. R. Moore and Mr. Axel Carlson.

The Dallas Quarry

About five miles southwest of Dallas, Oregon, on a spur line from the Salem Falls City Line of the Southern Pacific Railroad, the Oregon Portland Cement Company has opened a new quarry from which it is now securing the cement rock used in the manufacture of portland cement at its Oswego cement mill. They have been securing this cement rock from a quarry near the present one, but due to the increasing depth of overburden, it was abandoned in favor of this new deposit.

The deposit lies in a triangular formation with the apex of the triangle at the point where the side hill has been opened up to mine it properly. The present face is about 50 feet wide and will soon widen to 400 feet with a depth of about 40 feet.

The rock is loaded by hand into 3 yard Western wheeled scraper side dump cars. The deposit is shot with mud seams which have to be sorted out in order that the percentage of lime be maintained as high as possible. High lime rock is shipped from Roseburg, a distance of 200 miles,

making the transportation charge very high on this part; so it is important that the Dallas rock be well sorted.

A Fordson, equipped with driving wheels for a 36 inch gauge track, hauls the quarry cars to the loading bins. The track has been constructed on a one and seven tenths grade with a one and five tenths grade over the bins. The cars are dumped directly into the bins. Gates in the bottom of the bins allow the rock to fall directly into standard gauge railroad cars for shipment over the Southern Pacific Railroad Company's tracks to Oswego, Oregon.

Ingersoll Rand compressors and drills are used in operating the quarry. The power is supplied by Diesel engines. The deposit was overlaid with a 4 to 8 feet of clay and earth which was removed by a 2 inch hydraulic giant. Recent prospecting on the property of the company at Dallas has shown a ledge of lime rock running 77 per cent calcium carbonate. This will be prospected and if feasible will be developed and quarried to replace some of the Roseburg rock, thereby reducing the cost of manufacture considerably.

Mr. J. B. Bywater has recently been placed in charge of the operation of the Dallas quarry. The new quarry shows that great attention has been given to secure a steady flow of material at the least possible cost. Development work to secure several years' supply of rock ahead is being carried on continuously.



The New Dallas Quarry Showing Drill Marks on the Face

Earthquakes and Insurance

By Dwight Ingram

"EARTHQUAKE insurance? What in the world will they be trying to sell us next?"

As recently as last year property owners were known to make such an exclamation when an aggressive salesman tried to interest them in the idea of earthquake insurance. The question is not so common now, however. Instead, the same property owners, not only along the Pacific Coast and in the Rockies, but even in New York and New England, are going unsolicited to their insurance agents and buying policies without having to be "sold."

For some unknown reason North America seems to have come into a period of "abnormal seismic activity," as the scientists call it. Or, as the common citizen would say, we have had twenty-five earthquakes in North America during the first half of 1925, covering the entire continent from Alaska to Mexico and being felt in some degree from Maine to California. And while each quake means the adjustment of some long existing strain in the earth at the point where it occurs, with a consequent probability of immunity for that particular spot for a while, each quake also means that the earth strains have probably been passed on to some adjoining section of the country with a likelihood that such new strain will some time have to be relieved.

As a result of this great activity of the earth, quake insurance has now been permanently and prominently placed on the nation's program of sound underwriting. Such insurance has become almost universal in California. It is carried by property owners generally along the rest of the Pacific Coast and in the Rocky Mountain states. And it has actually come into wide use through the remainder of the United States. That it is not restricted to the far west will be surmised from taking note of the following large lines of earthquake insurance that are in force in the east and middle west. The office building at 60 Broadway, New York, is insured for \$3,000,000; the Schuster Stores of Milwaukee are insured for \$5,630,000; and the group of buildings making up the plant of a New England electric lighting corporation are insured for a total of \$20,000,000. While the significant

growth of quake insurance should really be judged by the large mass of policies being written daily on ordinary factories and homes, these giant accounts make rather spectacular incidents in the history of underwriting. Outside of the acknowledged earthquake sections of the country, most of the insurance has been written in New England and New York, where the tremors of last February indicated that we never can tell where a quake may strike, but since no place is guaranteed to be immune from disaster, a considerable amount of insurance is also being placed in the middle west and south.

Unlike the catastrophes of fire and industrial accidents, we have no elaborate science of preventive engineering for earthquakes. Guarding machines in a factory will forestall cut fingers, and putting in wired glass windows will keep fire from spreading from one building to another, but we have no similar safety code to protect us against the earth's activity. We do know that the more substantially built a building is, the less is the liability of damage. Frame sheds will be demolished more easily than brick structures, and buildings of re-enforced concrete will withstand some very heavy strains. But, after all, no one can prevent an earthquake. The only real protection can come through insurance, and business men prefer to collect their indemnity in a straightforward commercial way on policies they have bought rather than to become recipients of charity or relief funds.

Earthquake insurance is cheap. It is probably being sold right now below cost, for insurance actuaries are beginning to comb over their loss records rather carefully, and the general belief in the profession is that rates will be raised before the end of this year. There is one further peculiarity of rates that will doubtless be changed soon. At present machinery and other contents take the same rate (or, in California, even a higher rate) than the building itself. Loss records, however, show that quakes do much more damage to buildings than to machinery therein, and the next readjustment will probably find buildings rating higher than their contents.

The cost of insurance along the Pa-

cific Coast and in the Rockies runs from six to ten times as much as in the rest of the United States. Outside of the Pacific Coast territory, all buildings are grouped for rating in four classes: Class A, private residences, barns and garages; class B, fireproof buildings (of steel, re-enforced concrete or other non-combustible material); class C, buildings of ordinary brick, tile or frame construction not over five stories high and not over 5,000 square feet in ground area; class D, all buildings not covered by the first three classes. The rates for both buildings and their contents are:

Class A—.04 per \$100.

Class B—.04 per \$100.

Class C—.05 per \$100.

Class D—.06 per \$100.

Coinurance is generally used on earthquake policies. That is, a stipulation is put in that the property owner will carry insurance at least up to a stated percentage of the actual value of his plant, and if he should fail to do so will be called on to bear a proportionate part of any loss himself. In other words, if the usual policy contains an 80 per cent coinurance stipulation, it means that the owner of a \$10,000 building must carry insurance of at least \$8,000 if he expects the insurance company to pay his losses in full. There is no coinurance on private residences (Class A), but the rates quoted above for other buildings presuppose 50 per cent of coinurance. If the property owner intends to carry insurance equal to more than half the value of his plant, and is willing to make such an agreement in his policy, the following credits, or deductions from the above basic rates, may be given:

For 60% coinurance deduct 12.5%

For 70% coinurance deduct 22.5%

For 80% coinurance deduct 30%

For 90% coinurance deduct 35%

For 100% coinurance deduct 40%

Most policies are written for three years and paid for in advance, in which case the entire premium is $2\frac{1}{2}$ times the one year rates given above.

The legal contract or policy form used for earthquake indemnity follows almost exactly the general provisions of the standard fire insurance policy. Since the basic fire policy is so widely known and understood by business men, it is doubtless necessary to discuss only the two principal points in which the fire and earthquake contracts differ. Fire policies ordinarily

do not insure the foundations of buildings; these are practically not damageable by fire, and the producer does not want to pay a premium for something he could not collect on. With earthquake, however, the foundations are just as likely to be thrown out of line or otherwise damaged as any other part of the structure, and they are consequently included in the coverage. The second peculiarity of earthquake insurance is that it covers not only damage or destruction caused by the earth tremors, but also if fire ensues it covers such resulting fire damage. This is not covered by the regular fire insurance policy.

As with fire, wind and other catastrophes, earthquakes cause more loss than the direct destruction of property. If a plant is destroyed near the beginning of the operating season, the inevitable delay in rebuilding would mean that an entire year's profits would be destroyed. Such indirect loss, known as "business interruption" or "use and occupancy," is well known in fire insurance, and the principles are just the same for quake. In many cases it is more important for a producer to insure himself against loss of salaries, taxes and profits for a year due to earthquake demolition of his plant during the active season, than to cover the mere replacement value of his buildings. The rates charged for this indirect or business interruption loss for each \$100 of overhead expense and profits insured (outside the Pacific Coast) are:

Class A, residences—.03

Class B, fireproof—.024

Class C, small buildings—.03

Class D, large buildings—.036

Earthquakes have many other effects on insurance than the creation of new policies. They very definitely affect the validity and status of some more common forms of insurance. For instance, both the standard fire and the standard windstorm policy say that in case any part of the insured building shall fall except as the direct result of, respectively, fire or wind, the policy is immediately void. The reason for this is that a building which has partially collapsed is usually weak and presents a much greater risk than was figured by the rate charged. For fear some reader may think that this is a foolish distinction and that the fire insurance companies would have to pay for the entire building if it was burned up following earthquake,

we must note that there are plenty of records to show that they do not pay so freely. After the San Francisco earthquake in 1906 it was one or two days in many cases before the fire reached certain sections of the city that had been damaged by the quake. In this interval photographers, newspaper and amateur, went over the ruins making pictures. Fire insurance companies bought up quantities of these photographs, and from them were able to prove to many policy holders that most of the damage was done by the earth tremors. In such cases they paid for the estimated actual fire damage but not for the entire loss. This experience set so definite a precedent that insurance companies now have no trouble enforcing a fairly literal interpretation of this provision of the policy. If the fire follows the earthquake immediately, the only way to cover it is by earthquake insurance. If it does not, then the property owner holding fire or windstorm policies should immediately get in touch with his insurance agent and have him order new insurance or reinstate the old. Such reinstatement is going on in Santa Barbara right now. The fire insurance companies are mailing out riders to be attached to all of their policies stating that the insurance is again in force, but that the amount of loss will be reduced by any damage which has been done by the earthquake.

Another form of earthquake risk for which insurance is provided is the automobile or motor truck. For a charge of \$0.15 per \$100 of value a rider can be attached to the fire and theft policy covering any automobile or truck, extending the insurance to cover damage done not only by earthquake but also by windstorm, hail, explosion and water damage. If earthquake insurance is worth carrying on a building, it is probably also advisable on motor cars.

Quakes will usually, of course, create some legal liability on the part of the property owner for damages to the persons or property of others. Any injuries to employees in line of duty are naturally taken care of by the workmen's compensation policy, regardless of how those injuries are caused. As for damages to the public, a property owner is probably not liable for such losses which happen right at the time of the tremors, because these are so obviously beyond his control. He should pay especial

attention, however, to the possibility that his buildings or machinery have been weakened by the quake, because such weakening might leave them in condition where some part would fall or give way at a later date, in which case the property owner could undoubtedly be sued for damages.

An earthquake might conceivably help a producer in one way, for it might loosen or break up his material deposit so that the handling would be considerably simplified. In speaking of insurance, consequently, we recognize that indemnity is neither wanted nor possible on the deposit of material, and insurance policies will be limited to the buildings and machinery. Adjusting losses under earthquake policies is very difficult for both the insurance company and the property owner, however anxious they may be to work together and settle it up fast. The actual damage in many cases can not be fully appreciated for several days after the tremor occurred. For instance, if a supporting column is cracked, it is a nice engineering problem to determine whether it can be safely mended or whether it must be removed and replaced. And where, as often happens, the tremor causes a shift in the stresses of a building an apparently small amount of damage may be enough to require the tearing down and rebuilding of a large part of the structure in order to re-establish a safe equilibrium.

The destruction which earthquakes can cause is quite comparable to our greatest conflagrations. Overlooking such major catastrophes as San Francisco and Tokio, the tremors in Santa Barbara on June 29th of this year caused direct property damage conservatively estimated at \$12,000,000. And the quake that covered large areas of Wyoming, Idaho, Montana and Washington two days before wrought destruction of over \$500,000. This quake was actually more severe than that of Santa Barbara, but the damage done was less because its center fortunately was in a sparsely populated part of the country. It is estimated that the Santa Barbara quake caused an average of a 35 per cent loss to the insurance companies involved, but the damage in the Rocky Mountain tragedy fell almost entirely on the individual property owners, because until that time they had shared the feeling of most Americans that earthquakes could not happen east of the Pacific Coast.

How Peerless Portland Cement Company Reduced Material Handling Costs

By J. L. Langner, Chief Engineer, Stearns Conveyor Company

INCREASED building construction and road making during recent years have not only brought a greater production of cement, but have also intensified the need of cement mills for rapid and efficient handling of the bulk material. In many respects the average cement mill is faced with quite different problems from those encountered in ordinary manufacturing plants. The demand is largely seasonal; adequate reserve storage is difficult to obtain on account of the large quantities of materials needed; and the cost of handling must be kept down to the minimum in order to meet competition. The cost of handling, moreover, is a greater proportion of the total cost in the cement industry than it is in other lines of production.

In order to reduce the handling expense as far as possible, the Peerless Portland Cement Company of Detroit, Michigan, decided to install a conveyor system for handling its crushed stone and coal from the unloading to the storage points. In certain respects the problems presented were somewhat unusual. The quarries from which the raw materials are obtained are so situated with regard to the mill that raw material can be brought up by water. This means cheap transportation, but it also means that this route is open for only eight or nine months of the year. It is necessary to provide sufficient storage facilities to tide over the period when the water route is closed. For these reasons it is essential that the material handling equipment have as low an operating cost and as efficient working units as possible. In this way the storage piles will be drawn upon as little as possible during the open season, and large storage area will be provided.

The method used by the Peerless Portland Cement Company is worth studying. The company's freighters, which are fully equipped with conveyors, dock alongside the plant, and by means of the conveyor unloading boom with which each vessel is provided, they unload the raw material into a 20x20 foot square steel hopper

mounted on a steel supporting frame 36 feet above ground level. The limestone, which is crushed to a size of 2½ inch mesh and under, is drawn out through the bottom of the hopper through a regulating chute which governs the flow of the material directly onto the belt of the conveyor. This belt conveyor consists of a 54-inch belt about 590 foot horizontal pulley centers. The actual length, however, is slightly more than this because from the bottom of the receiving hopper the belt has to be inclined upwards to an elevation of 38 feet above ground level in order to carry the conveyed material over the roof of the adjoining building. At a distance of 65 feet from the center of the receiving hopper the belt again runs horizontally and continues to do so for the remainder of the conveyor length.

The distribution of the crushed limestone to the storage pile is accomplished by means of an automatic belt tripper, with a double discharge spout and fly-gate. This automatic belt tripper is, to the best of our knowledge, the largest ever built by anyone. The total travel of the tripper is 490 feet, but this travel can be shortened to any desired extent, or the tripper can be clamped stationary at any desired point. The driving mechanism is simple and effective, and is driven from the conveyor belt through a series of chains and gears. The reversing gear operates with steel friction disc clutches. A 200 H.P. 870 R.P.M. motor driving through silent chain and spur gear to tandem pulleys furnishes the operating power for the conveying units. The installation is capable of handling as high as 2,500 tons per hour at a belt speed of 540 feet per minute.

An interesting angle to the investigation made as to the power required to operate the above equipment was the striking saving made possible in operating and maintenance cost through the use of Stearns standard ball-bearing troughing idler pulleys and return rollers as compared with plain bearing type generally used. This saving was especially noticeable



Material Being Discharged Into Hoppers for Distribution By Belt Conveyor



Detail View of the Ball Bearing Troughing Idler Pulleys

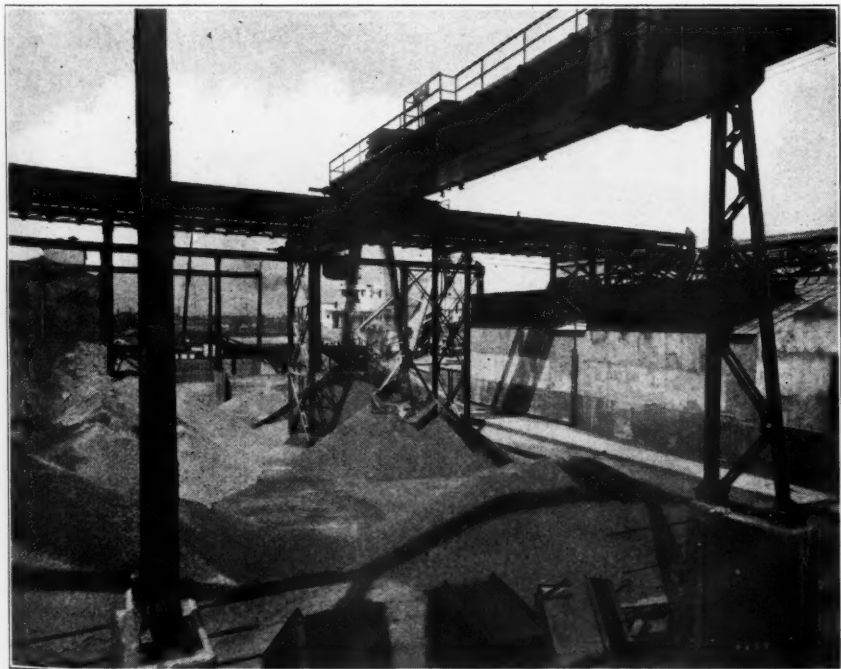
on the long conveyors used in this installation. In this instance it was found that there was a saving in the driving power required which amounted to 35 per cent. This, however, did not end the economy. It was further found that in view of the reduced horse-power to be transmitted, and the consequent lessened strain on the belt, it was perfectly satisfactory to use an 8-ply belt instead of the 12-ply belt which would have been necessary otherwise. The difference in belt cost was more than sufficient to pay for the slightly increased expense of the roller bearing carrier pulleys and return rollers. In order to take care of the belt-stretch, two belt take-ups are provided. One is a horizontal type gravity take-up having a five-foot travel. This is placed at the head end. The other, which is installed at the foot end of the conveyor, is of the screw type and has a three-foot travel.

Reclaiming the crushed limestone from the storage piles is done by means of two electric overhead cranes equipped with grab buckets. One crane is located on each side of the belt conveyor and has a runway 540

feet long running parallel to the conveyor belt.

The coal is handled in a somewhat different manner. There are two alternative methods whereby coal is received at the plant; by boat, and by rail. In locating the storage space it was decided that it should be adjacent to both the limestone storage and the water front. This location, however, while desirable from many considerations, was somewhat awkwardly situated with regard to the railroad tracks. These tracks are 410 feet distant and are on the far side of the limestone storage piles. Since it was obviously impossible to obstruct the operation of the reclaiming cranes and buckets by carrying the coal across the limestone storage piles, it was decided to put the conveyor underground. The following arrangement was adopted.

The coal is discharged from the railroad cars into a 12-foot square steel hopper. Thence it passes to a 30-inch apron feeder operating through a countershaft driven from the foot shaft of the 30-inch belt conveyor leading to the coal storage.



The Storage Pile Distribution System

The apron feeder is installed in a pit under the railroad track. From this point the coal is received upon the above mentioned belt conveyor, which is situated in a concrete tunnel about 375 feet long which passes under the limestone storage piles. Near the farther end of the tunnel the belt begins an incline to about 20 feet above ground level. At this point it discharges into a 15-foot square steel hopper.

Driving this conveyor, which is on 400 foot centers, is a set of tandem pulleys operated through counter-shafts by a 20 H.P. 720 R.P.M. motor. The conveyor belt speed is 250 feet per minute, and the handling capacity is 125 tons of "run-of-mine" coal per hour.

From the hopper the coal is discharged into a 24x32 inch single roll crusher, and thence it passes to a 24-inch belt conveyor of 50 feet centers. This conveyor runs at right angles to the 30-inch belt and at an incline of 20 degrees. It discharges direct to the coal storage pile.

All conveyor equipment, including the hoppers and the steel supports, was designed and made by the Stearns

Conveyor Company of Cleveland, Ohio. In view of the substantial savings of power and maintenance expense already outlined, Stearns roller bearing idler pulleys and return rollers were used throughout.

The plant of the Peerless Portland Cement Company at Detroit has recently been completed and has cost altogether about \$3,000,000. It will be seen from this partial description of its manufacturing and handling equipment that it is a thoroughly up-to-date and efficient plant.

P & H Foreign Bulletins

Harnischfeger Corporation of Milwaukee, Wisconsin, have recently issued bulletins covering their general line of excavating machinery, published in both Spanish and Portuguese.

In these bulletins is given the general description of the construction and operation of gasoline, Diesel or electric shovels, draglines, clamshells, cranes, trench hoes, skimmer scoops, pile drivers, cane loaders, wheel and ladder type trenchers, backfillers, and truck cranes, as well as clearance specifications for these machines.



Deck of Freighter Showing Unloading Boom

An Interesting Quarry Operation

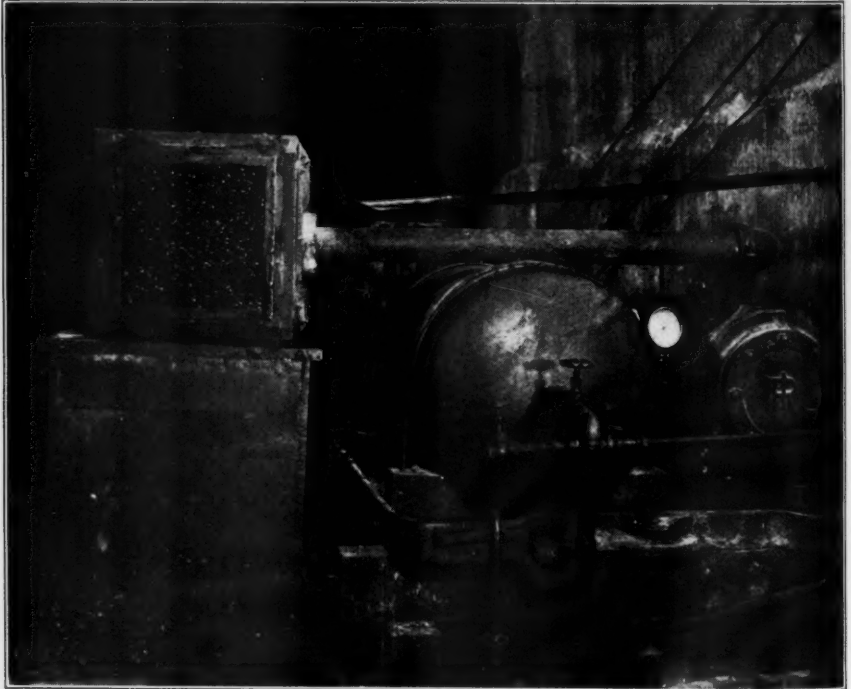
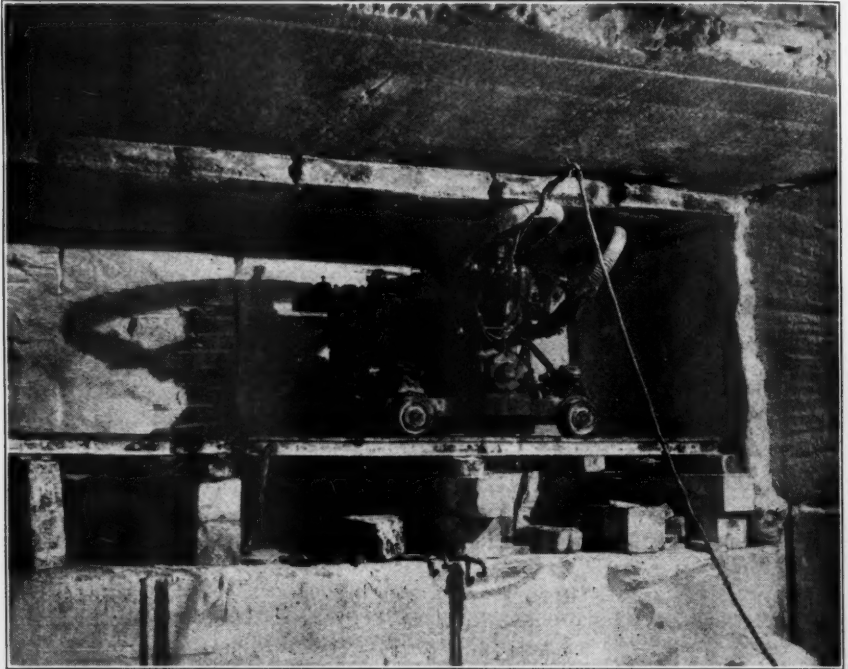
By George Ransom

ALTHOUGH the quarrying operations of the Vermont Marble Company have been freely discussed in print because of the up-to-date methods employed by the company, the very progressiveness of the company makes it desirable to

keep in touch with what they are doing. The Riverside quarry located in the township of Proctor, Vermont, is interesting because a part of it is covered. Furthermore the openings are located near the Otter Creek which overflows its banks every



Block of Marble Being Pulled Horizontally By Means of the Top Derrick to the Opening



Top View Shows Electric Channelling Machine While Bottom View Shows Electrically Driven Compressor

spring. In order to save the quarry from being flooded the openings have been built up with marble blocks and concrete to something like $3\frac{1}{2}$ to 4 feet above the surface.

The fact that operations are now being carried on in a tunnel 400 feet back from the opening, calls for special arrangements for getting out the blocks of stone. To accomplish this

there are two derricks, one on the top of the quarry and another on the old floor 110 feet below the surface. The tunnel portion is considerably lower than the old floor of the open part of the quarry, and, of course, the blocks of marble are raised up to the latter level by means of a derrick. The hoisting is done from above. When the stone has been de-



Block of Marble Being Lifted From the Bottom of Tunnel By Derrick

posited on the old floor, it is loosened from the lower derrick and dragged along to a point under the opening by means of the upper derrick and sheave. It is then raised up through the opening by the upper derrick. As the quarry blocks of marble weigh from 15 to 20 tons apiece, the method of getting them out is a proposition requiring engineering skill of no mean order.

The equipment at present in this quarry is as follows:

- 4 Channelling machines with 12 H.P. slip ring motors to run the compressors.
- 2 Electric drills—5½ H.P.
- 4 Ingersoll-Rand air drills.
- 1 Ingersoll-Rand air compressor with 50 H.P. squirrel cage motor.
- Small Gould pump with 2 H.P. squirrel cage motor.
- Large Gould pump with 35 H.P. squirrel cage motor.
- 112 H.P. motor for hoisting.
- 5 H.P. motor for turning the derricks.

Pumping is done in two stages. A small Gould pump lifts the water from the tunnel into the "well,"—the lowest part of the abandoned portion of the quarry. A large pump raises the water from the well to the surface.

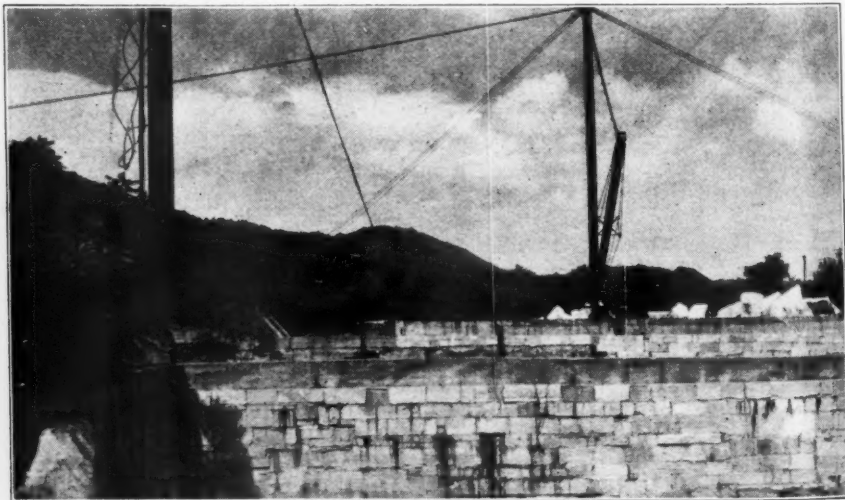
Mica in 1924

The total quantity and value of domestic uncut mica sold by producers in the United States in 1924, as reported by the Bureau of Mines, Department of Commerce, was 5,439 short tons, valued at \$299,277. Of this quantity 730 tons (1,460,897 pounds), valued at \$212,035, was sheet mica; the rest was scrap mica.

The production was made by 10 States—North Carolina, New Hampshire, South Dakota, Virginia, New Mexico, Georgia, Colorado, South Carolina, Connecticut, and Alabama, named in order of total quantity sold from greatest to least.

The total quantity of uncut sheet mica sold in 1924 showed a decrease of 29 per cent, and the value a decrease of 32 per cent, as compared with 1923. The figures for the quantity and value of scrap mica sold are not strictly comparable with those of 1923, as the figures for 1924 are exclusive of mica derived from mica schist, while the 1923 statistics include some of this material.

The most notable decreases were shown by North Carolina and New Hampshire, whose sales of uncut sheet mica dropped—in North Carolina 47 per cent in quantity, and 42 per cent in value, and in New Hampshire 11 per cent in quantity and 18 per cent in value.



Top of Riverside Quarry of The Vermont Marble Company. Walls of Concrete and Marble Blocks Have Been Built Around the Opening to Keep Out Flood Waters

Concerning the Hydraulic Elevator

By G. B. Massey

THE August 15th number of Pit and Quarry contained an article describing the sand moving apparatus of the Ward Sand and Gravel Company of Oxford, Michigan. This device consists of introducing pressure water by a nozzle into a pipe in such a direction that it creates a partial vacuum, thus sucking into a branch of the pipe sand and gravel when this branch is placed in contact with sand and gravel. This is the hydraulic elevator in its most simple and inefficient form.

Hydraulic elevators have been used in California for a great many years for elevating by water pressure sand and gravel which has been excavated by the hydraulic gun and is to be raised to a higher elevation to run through the sluice.

The hydraulic elevator has been perfected to such an extent that it is now equipped with a manganese steel throat between the vacuum chamber and the discharge pipe. This greatly increases the efficiency of the apparatus so that the efficiency now stands at about 25 per cent as against 50 per cent for a dredging pump. It is probable that the arrangement without the throat is very much less than 25 per cent efficient.

The U pipe part of the apparatus has nothing to do with the working of it but is simply a convenient method of bringing the pressure pipe to the location of the nozzle.

In 1922 the writer had a problem of moving about 20,000 cubic yards of sand in a pool a distance of about 400 feet. It so happened that no electric power was available, that the work had to be done with great dispatch and the question of cost was, of course, considered. It happened that the work was being done in connection with the improvement of conditions existing about the municipal water works so that pressure water was available 600 feet away at almost any reasonable pressure, and the only cost for supplying the water was the extra fuel and the pipe line to the water's edge. It also happened that there was a substantial timber barge which would not answer for the hull of a hydraulic dredge on account of its size.

It was decided that the best method to use under the circumstances would

be a hydraulic elevator, and the builders of these devices were approached, who replied that the hydraulic elevators work with a very shallow depth of water at the suction point and that it was believed that a mixture of air with the water, sand and gravel being elevated was necessary for the proper performance of the mechanism. They also said that these machines were used to elevate material in an almost vertical direction, and it was doubted whether it would be able to carry sand through a horizontal discharge line 400 feet long.

After the matter was considered again very carefully, it was decided to persist in the installation of a hydraulic elevator, and one was purchased together with the necessary pipe. The elevator was mounted on a small scow; pressure water was brought down from the water works and brought aboard the scow by a floating pipe line with a long, flexible rubber hose at the shore end and barge end so as to allow the barge to move around the pond.

The discharge line was led from the discharge orifice of the hydraulic elevator on barrel pontoons, a distance of 400 feet, where the end was lowered so that it discharged under water so that there was no static head. The suction pipe was connected to a suction chamber and was led by means of a flexible rubber suction hose and suction pipe to a point below the water surface where the sand was to be excavated. This suction pipe was raised and lowered by means of a hand winch, and the barge was moved about the pond by hand operated lines.

At first, results were unsatisfactory because it was found that, contrary to expectations, the shell of the elevator was not air tight. This was remedied, and the equipment gave good results from that time on to the completion of the job. It was found that a pressure water was ample, and no improvement was found by increasing the pressure to 80 pounds per square inch. No difficulty at all was experienced in pumping sand at the rate of from 50 to 60 cubic yards per hour through a 12-inch pipe.

The elevator began to pick up material at 25 pounds pressure and sending the facts to the Interstate Commerce Commission. This affords

worked well at 40 pounds, but 70 pounds was the usual pressure used. The work was accomplished at much less than the sum set aside for it, and all the material was salvaged after completion. As stated above, there were several reasons why this arrangement was used, but the same reasons would apply only now and then.

To meet ordinary conditions the centrifugal pump is a much more efficient piece of machinery to use, having twice the efficiency of the hydraulic elevator in its most refined form and probably three times the efficiency of a hydraulic elevator as used at the plant of the Ward Sand and Gravel Company.

Cement Experts Meet

An advisory committee of technical experts on Portland cement consisting of representatives of the United States Bureau of Standards, the Portland Cement Association, and the American Society of Civil Engineers met on September 10th at the Bureau of Standards to review the work recently accomplished in the cooperative research now being undertaken by these groups.

Among the most noteworthy results reported at the conference may be mentioned the exacting experimentation which has led to an acceptance of the findings of the Geophysical Laboratory of Washington on the exact chemical and physical nature of the primary compounds of Portland cement. This view differs in some respects from that held by many European investigators. The American view, in general, holds that Portland cement exists in the $\text{CaO}-\text{Al}_2\text{O}_3-\text{SiO}_2$ system in the field $2\text{CaO}\cdot\text{SiO}_2-3\text{CaO}\cdot\text{SiO}_2-3\text{CaO}\cdot\text{Al}_2\text{O}_3$, these compounds being the principal constituents of the cement, while some European writers believe that the compound $8\text{CaO}\cdot\text{Al}_2\text{O}_3\cdot 2\text{SiO}_2$ is the principal hydraulic constituent. Others are convinced that there exists a solid solution of $\text{CaO}+2\text{CaO}\cdot\text{SiO}_2$.

Every effort is being made to concentrate on the fundamental problems of the constitution of Portland cement and the exact influence of each constituent. While studies on hydration and setting are under way, it is held important that these be not investi-

gated exhaustively until reliable principles on constitution have been established. The studies on setting will then be made with the products of rigidly controlled composition. By this means basic laws of composition and behavior in use should be established. For some time the work will be of more interest and use to the producer than to the consumer of cement.

The research staff consists of nine specialists in physical chemistry, petrography and engineering, who have been studying the fundamental problems of Portland cement during the past fifteen months.

Lime Sold In 1924

Sales of lime by manufacturers in the United States in 1924 amounted to 4,072,000 short tons valued at \$39,596,423 f. o. b. kilns, according to a compilation of reports of producers made by the Bureau of Mines Department of Commerce. These figures show a reduction in quantity of less than one per cent and in value of about one per cent from the 1923 figures of 4,076,243 tons and \$39,993,652. The average value per ton at the kilns in 1924 was \$9.72 compared with \$9.81 in 1923.

Lime sold for building and construction amounted to 2,169,700 tons valued at \$23,011,935, an increase of about 2 per cent in both quantity and value. Lime sold for chemical uses amounted to 1,653,964 tons valued at \$14,719,974, a decrease of 3 per cent in quantity and 6 per cent in value. Lime sold for agricultural purposes amounted to 248,336 tons valued at \$1,864,514, an increase of 3 per cent in quantity and 2 per cent in value.

The sales of hydrated lime in 1924, included in the above total, were 1,316,664 tons valued at \$13,199,846, an increase of 7 per cent in quantity and 8 per cent in value. About 78 per cent of the hydrated lime sold—1,029,384 tons valued at \$10,420,151—was for construction work. This was an increase of 12 per cent in quantity over 1923. Hydrated lime for chemical uses (158,870 tons valued at \$1,618,873) and for agricultural purposes (128,410 tons valued at \$1,160,822) both showed decreased sales as compared with 1923.

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The Nazareth Continuous Cement Bag Cleaner

The Nazareth continuous bag cleaner is manufactured by the Nazareth Foundry and Machine Company. The cleaner is a combination of a revolving screen with lifters, within an air tight chamber, connected to a dust collector. The bags to be cleaned are fed into the receiving hopper by means of a belt conveyor. The bags pass through the revolving drum and are discharged through a hopper at the rear of the machine. The reclaimed cement is deposited into a bin running the full length of the screen and is conveyed back into the system.

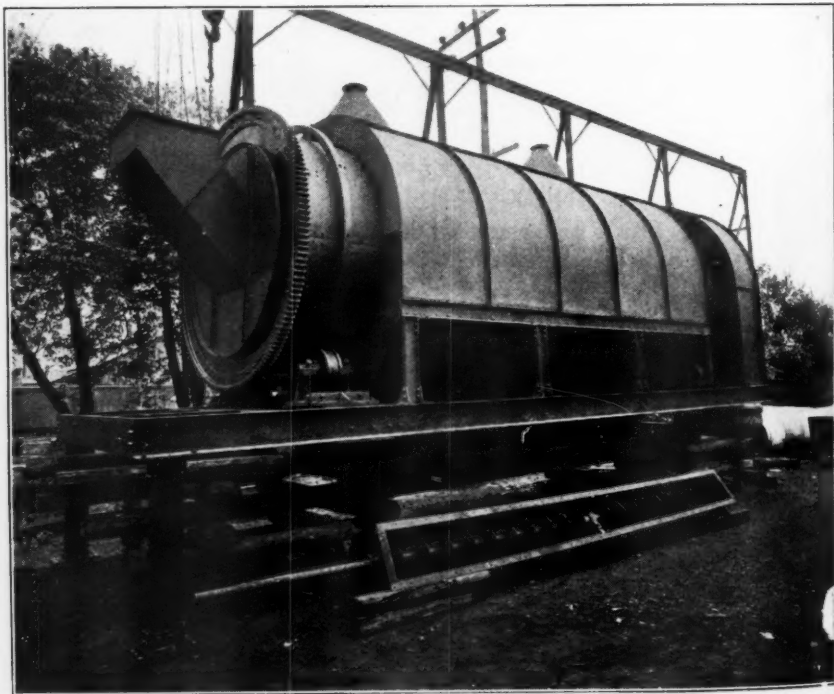
As it requires seven minutes for the passage of a bag through the machine, split shipments can be separated by allowing a minute or two to elapse when feeding each consignment through the machine.

The machine is in reality a labor saver as it reduces the cost of handling bags. It also reduces the dust nuisance, reclaims material and gives a clean bag. Approximately one pound of cement is saved per bag. The cleaners are built with capacities rang-

ing from 200 to 10,000 bags per hour. The machine can be arranged for gear or chain drive.

Vacuum Recorder Bulletin

Vacuum Recorders are covered in new Bulletin No. 140 issued by Uehling Instrument Co., of Paterson, N. J. These instruments operate on the mercury column principle and employ no moving parts, springs or diaphragms. Permanent accuracy is claimed for this principle, which is clearly illustrated by a sectional diagram. The high degree of legibility of the Uehling Vacuum Recorder is due to the fact that the condenser's working range of vacuum is recorded over nearly the full face of the chart, while the lower degrees of vacuum down to atmospheric pressure, are recorded on a greatly contracted scale. This is clearly illustrated by the sections of typical charts, reproduced full size in the bulletin. One chart makes a record on a scale that is nearly as wide as that of the standard indicating type of gage.



The Nazareth Continuous Bag Cleaner



Put Western Dump Cars on Your TOUGHEST Job

Quarry work requires an extra strong car, a car that will take care of itself, a car that will permit you to push your shovel to the limit.

Western Heavy Duty 4-yard and 5-yard dump cars, 36-inch gauge, with their reinforced end construction, are built for quarry and similar heavy work.

The Western 6-yard dump car, standard gauge, has no equal. It has been installed in scores of quarries throughout the United States for both stripping and handling stone.

The experience of practical men over a long period of years on thousands of tough jobs, is behind Western dump cars. That's why.

Western dump cars are available in all sizes from 1½ yards to 50 yards. We shall appreciate an opportunity to tell you more about them.

Send for Our Catalog P-61.

Western



Western Wheeled Scraper Company

Founded 1877

Earth and Stone Handling Equipment
AURORA, ILLINOIS

FOR SALE OR RENT

STEAM SHOVELS—Railroad Type

(Note—All Railroad Type Steam Shovels can be furnished on full caterpillar mountings if desired.)

- 1—95-C Bucyrus. Shop No. 1235, 4-yd. or 5-yd. dipper.
- 1—Model 80 Marion. Shop No. 1312, 4-yd.
- 1—Model 75 Marion. Shop No. 2112, 2½-yd. or 4-yd. dipper.
- 3—70-C Bucyrus. Shop Nos. 1197, 1277 and 1582. 2½-yd. dipper.
- 4—70-ton Bucyrus. Shop Nos. 920, 939, 977 and 1233, 2½-yd. dippers.
- 5—Model 69 Marion. Shop Nos. 1301, 1995, 1999, 2059 and 2238, 2½-yd. dippers.
- 2—60-C Bucyrus. Shop Nos. 1286 and 1388, 2½-yd. dippers.
- 1—45-C Bucyrus. Shop No. 1201, 1½-yd. dipper.

Steam Shovels—Full-Revolving

- 1—80-B Bucyrus Stripping Shovel. Shop No. 4002, New 1923, 2½-yd. dipper.
- 1—50-B Bucyrus. Shop No. 3744. New 1922. 1½-yd. standard dipper or 2-yd. coal loading dipper. Caterpillars
- 1—Model 36-Marion. Shop No. 4727, 1½-yd. dipper. Caterpillar.
- 2—Model 31-Marion. Shop Nos. 3341 and 3613, 1-yd. dipper. Traction wheel or railroad truck mounting.
- 1—18-B Bucyrus. Shop No. 1870, ¾-yd. dipper. Traction.
- 1—Model 21 Marion. Shop No. 4294. Steel Caterpillars. ¾-yd.
- 2—Type "B" Erie. Shop Nos. 296 and 1484. Traction wheel. ¾-yd. dippers.
- 1—14-B Bucyrus. Traction. Shop No. 1416. ¾-yd. dipper.

SIDE DUMP CARS

- 36—16-yd. Western Air Dump Cars.
- 12—12-yd. Western Air Dump Cars, 19-ft. beds, box girder doors.
- 4—12-yd. Western Hand Dump Cars, 19-ft. beds, box girder doors.
- 26—12-yd. Western Air Dump Cars, Truss-rod doors, 26-ft. beds.
- 2—12-yd. Oliver Hand Dump Cars.
- 10—6-yd. K. & J. Steel Sills, Truss-rod doors.
- 5—4-yd. Western Heavy Duty. 36-in. gauge. Steel lined floors.
- 8—2-yd. Western, 36-in. gauge.
- 55—1½-yd. Western, 24-in. gauge.

SPREADER CARS

- 3—Std. gauge Western Spreader Cars.
- 1—36-in. gauge Oliver Spreader Car.

STEAM SHOVEL PARTS

- 1—Boom for Marion 60 or 61 Shovel, length 35-ft. 22-ft. dipper arm, 1½-yd. dipper, long jack arms, etc.
- 1—19-ft. 6-in. boom, 12-ft. sticks and ditcher bucket for Type B Erie Shovel.
- 1—22-ft. dipper stick for Type B, Erie Shovel.

LOCOMOTIVES—Standard Gauge

- 1—17x24 Schenectady 6-wheeled Switcher with tender. Shop No. 2956. Weight 44 tons.
- 1—16x24 Vulcan 4-wheeled Switcher, with tender. Shop No. 1764. Steam pressure 180 lbs. Weight 40 tons.
- 1—16x24 Davenport 4-wheeled Switcher, with tender. Shop No. 860. Steam pressure, 170 lbs. Weight 38 tons.
- 1—11x16 Davenport 4-wheeled Saddle Tank Locomotive. Shop No. 1027. Weight, 20 tons. Steam brakes.

LOCOMOTIVES—36-in. Gauge

- 1—9x14 Vulcan Dinkey. Shop No. 1675. Weight, 14 tons.
- 2—7x12 Davenport, 4-wheel Saddle Tank. Shop Nos. 1566 and 1567.
- 1—9-ton Whitcomb Gasoline Locomotive.

LOCOMOTIVES—24-in. Gauge

- 3—7x12 Davenport Dinkies. Shop Nos. 1202, 1411 and 1524. Weight 9 tons.
- 1—6x10 Davenport Side Tank Dinkey. Shop No. 1307. Weight, 7 tons.
- 1—6-ton Whitcomb. Shop No. 1259. Gear drive. Gasoline.

DRAGLINE EXCAVATORS

- 1—Class 24 Bucyrus. Steam. New in 1919. 115-ft. boom, 3½-yd. Page bucket. Skids and rollers.
- 2—Class 24 Bucyrus Steam. Shop Nos. 3445 and 3500, skids and rollers, 85-ft. to 100-ft. booms; 3½, 4½ or 5-yd. Page buckets.
- 1—Class 20 Bucyrus. Shop No. 740. Skids, 85-ft. boom. 2½-yd. bucket.
- 1—Class 14 Bucyrus. Steam operated. Shop No. 745. Skids, 60-ft. boom, 2-yd. bucket.
- 1—Monighan No. 2. Shop No. 789. Skids, 60-ft. boom. 2-yd. bucket.
- 1—Model 210 P. & H. Shop No. 1077. Gasoline. Caterpillars. 42-ft. boom. 1-yd. bucket.
- 1—30-B Bucyrus. Shop No. 3640. Caterpillars. 40-ft. boom. 1-yd. bucket.

CRANES

- 1—10-ton Industrial, 4-wheeled. Shop No. 1989. 40-ft. boom, bucket operating.
- 1—15-ton Ohio. Shop No. 3441. 8-wheeled, M.C.B. trucks. 40-ft. boom, with 10-ft. extension, bucket-operating drums, 1-yd. bucket.
- 1—20-ton McMyler, 8-wheeled. Shop No. 388, 45-ft. boom, 1½-yd. O & S clam.
- 1—Gantry Crane. New in 1919. 40-ft. boom, 15-ton cap., at 18-ft. radius; 7-ft. 10½-in. gauge, 12-ft. wheelbase, self-propelling. Base of boom 17-ft. above track. Bucket-operating drums. Weight, 50 tons.
- 1—Type J McMyler, 35-ton capacity, with 70-ft. boom. Shop No. BC-2376. Serial No. 3312, 8-wheel MCB trucks, A.S.M.E. boiler.

BUCKETS

- 1—1½-yd. Class "S" Page Dragline bucket.
- 1—2½-yd. Class "S" Page Dragline bucket.
- 1—3½-yd. Class "C" Page Dragline bucket.
- 1—¾-yd. Lakewood Clam Shell.
- 1—1-yd. Browning Clam Shell. Reeved type.
- 1—1½-yd. Williams Hercules Clam Shell.
- 1—1½-yd. Brown Hoist Clam Shell.
- 1—1½-yd. Williams Favorite.
- 3—Meud-Morrison 1½ yd. Clam Shells.
- 2—1½-yd. O. & S. Coal Loading Clam Shells.
- 1—¾-yd. Type "J" Owens.

MISCELLANEOUS

- 1—8-ft. Austin Giant Road Grader.
- 1—6x10 D.C., D.D., Lidgerwood Hoist, with 36x 90-in. boiler.
- 1—6½x10 D.C., D.D. American Hoist, with butt strapped boiler.
- 1—7x10 D.C., D.D. Lambert Hoist, without boiler.
- 1—7x10 D.C., D.D. Flory Hoist, without boiler.
- 1—Lambert 8½x10 Double Drum with boiler.
- 16—No. 8 Milburn Carbide Lights, 8000 Candle Power.
- 4—No. 12 Milburn Carbide Lights, 12,000 Candle Power.
- 9—Milburn Reliance Carbide Lights, 1,000 Candle Power.
- 6—Milburn Builders Carbide Lights, 500 Candle Power.
- 1—No. 55 Buhl Portable Air Compressor.
- 13—No. 90 Buhl Portable Air Compressors. New.
- 2—20-hp. Upright Boilers.
- 1—No. 10 Byers Semi-Caterpillar Steam Crane. 40-ft. boom, ¾-yd. Blaw-Knox bucket, practically new.

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- 3—78-C Bucyrus, 1923 model, 30-ft. boom, 19-ft. dipper stick, 3-yd. dipper, two on railroad trucks, one on caterpillar. Shop Nos. 4001, 4124 and 3995.

LOCOMOTIVES

- 2—Porter, standard gauge, saddle tank, cylinders 14x22, weight 42 tons, only one year's service, like new. Shop Nos. 6770, 6853.
- 4—Porter, 36-in. gauge, 18-ton, saddle tank, cylinders 10x16, rebuilt like new. Shop Nos. 4619, 4667, 6748 and 6804.

CARS

- 20—Continental 4-yd. 36-in. gauge, 2-way dump cars.

JACK HAMMERS

- 1—Sullivan D. D. 33 Jackhammer.
- 1—Ingersoll-Rand D.C.R. 13 Jackhammer.
- 4—Ingersoll-Rand D.C.R. 23 Jackhammers.
- 18—Ingersoll-Rand D.C.R. 430 Jackhammers.
- 2—Hardsocg No. 60 Jackhammers.

CRANES

- 1—Link Belt, 22-ton, locomotive crane, 50-ft. boom.

COMPRESSORS

- 1—2-stage, 950-ft. Sullivan Class N.B. Compressor.
- 1—2-stage, 1500-ft. Sullivan, stationary Compressor.

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- 2000 tons—30, 40, 60, 75 and 85-lb. rail.
- 24300 Std. Ga. wood Ties.

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- 3—No. 3 1/2 Keystone drills.
- 1—No. 5 1/2 Keystone drill.
- 6—Model 21, Waugh "Denver" derrick drills.
- 8—Model 31, Waugh "Denver" column drills.
- 1—D.W. 64, Sullivan column drill.
- 1—Sullivan tripod drill.
- 2—Ingersoll-Rand tripod drills.
- 3—Ingersoll-Rand, Class G. 31, Calyx drills.
- 2—Ingersoll-Rand, Class G.O. 2843 and 2844, Calyx drills with pumps.

CRUSHER PLANT

- 1—Complete Crusher Plant.

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Large quantity late model American Stiff Leg Derricks, mast 14x14x40., booms 14x14x60 ft., stiff legs 14x14x50 or 60 ft., sills if desired, with 12 ft. steel bull wheel, for hook work or bucket operation.

Large quantity late model American Stiff Leg Derricks, mast 16x16x40 ft., boom 14x14x80 ft., trussed with hog rods, legs and sills 14x14, with 16 ft. steel bull wheel, arranged for hook work or bucket operating.

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Large quantity late model American double-drum with attached swinging gear, capacity 6000 pounds; on a single line of 162 ft. per minute; either hand levers or levers banked in quadrant. Can furnish either 37 H.P., 440 or 220 volt, A.C., 60 cycle, 3 phase, alternating current, or 35 H.P., 220 volt, direct current, or can furnish without electrical equipment suitable for gasoline or belt drive.

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- 1—Erie "B" 32-ft. Boom, $\frac{3}{4}$ -yd. Wms. Bkt.
- 1—O & S 12-ton Cat., Gas Power, 50-ft. Boom, 1-yd. Bucket.
- 1—Northwest Mod. 104 Caterpillar.
- 1—Erie "B" Caterpillar.
- 2—No. 8-C 8-wheel Browning Loco. Cranes.
- 1—Marion 21 Steam Crane on Cat.
- 2—Ohio, 25-ton, 8-wheel, late models.

SHOVELS

- 1—Type "B" Erie Full Cat.
- 2—Model 4 Keystone Excavators.
- 22—Marion and Bucyrus, mounted on Cat. Trac. Wheels and R. R. Type from $\frac{3}{4}$ to 4-yd. cap.
- 1—Marion 37 on Cat. with $1\frac{1}{4}$ -yd. Dipper.
- 1—Type "O" Thew on Cat.

DERRICKS

- 20—Others ranging from 3 to 20 tons.
- 1—Wood Stiff Leg, 60-ft. Boom.

HOISTING ENGINES

- 2—8 $\frac{1}{4}$ x 10 D/C D/D's with Boilers.
- 8—7x10 D/D's Am. La. Lidg. Mundy.
- 1—8 $\frac{1}{4}$ x 10 3-D Stroudsburg.
- 1—7x10 3-D Stroudsburg.

DRAGLINES

- 10—Dragline Outfits, including Monighan, Bucyrus, Fairbanks, Morse and Marion, ranging from $\frac{3}{4}$ to 4-yd. cap.
- 1—Marion 21, Steam Cat.
- 1—Monighan, 1 $\frac{1}{2}$ -T Walker Type.
- 1—Monighan 2-T Walker, Oil Engine Drive.
- 1—Monighan 3-T Walker, Diesel Engine Drive.

LOCOMOTIVES

- 4—Std. Ga. Davenport, 21 tons, Saddle Tanks.
- 1—24 Ga. Plymouth Gas Power.
- 2—36-in. Ga. Porter, 18-ton Saddle Tanks.
- Also 4 Std. Ga. ranging from 20 to 50 tons.

CARS

- 20—Std. Ga. Western 12-yd. Air Dump.
- 22—Std. Ga. 6-yd. Continental.
- 10—24 Ga. Western Steel Flat.
- 10—4-yd. Western 36-in. Ga.

MISCELLANEOUS

- 1—1-yd. Class "E" Hayward Clam Shell.
- 1— $\frac{3}{4}$ -Yd. Williams Favorite.
- 1—Standard $\frac{3}{4}$ yd. Clam Shell.
- 1—No. 5 Gates Gy. Crusher.
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- 1-70-C Bucyrus. Shop No. 1749. Standard gauge, railroad, 2½-yd. dipper.
- 1-Model 60 Marion. Shop No. 1463. Standard gauge, railroad 2½ yd. dipper (butt strap boiler).
- 1-18B Bucyrus, revolving. Shop No. 1764. Traction wheels, ¾-yd. dipper.
- 1-Type B Erie Revolving Steam Shovel, traction wheels, standard boom, ¾-yd. dipper.
- 1-Model 212 Marion (revolving). Shop No. 4620. Mounted on trucks, 55-ft. boom, 34-ft. dipper stick, 1¾-yd. dipper. Only used enough to be broken in; compares favorably with new.
- 1-Model 28 Marion, standard revolving. Shop No. 2804, traction wheels, ¾-yd. dipper.
- 1-Little Giant Railway type, standard gauge, equipped with standard boom, 1¾-yd. dipper.

DRAGLINES

- 1-Class 210 P & H Gasoline. No. 1349, on caterpillars, 76-hp. Twin City Engine. 48-ft. boom, 1-yd. bucket.

DRAGLINES—Cont.

- 1-Class 14 Bucyrus, steam operated, on caterpillars, 60-ft. boom, 2-yd. Page bucket. Shop No. 3706.
- 1-Class 24 Bucyrus, steam operated, skids and rollers, 100-ft. boom, 3½-yd. bucket.
- 1-Class 24 Bucyrus Electric Driven, skids and rollers, 100-ft. boom, 3½-yd. bucket.
- 1-No. 2 Monaghan, steam operated, skids and rollers, 70-ft. boom, 2-yd. bucket.

DUMP CARS

- 60-1½ yd. Western, 24-in. gauge, Dump Cars.

TRACTOR

- 1-5-Ton Best, caterpillar.

MISCELLANEOUS

- 1-¾-yd. dipper for Model 18 Osgood Shovel.

FOR RENT

- 1-20B Bucyrus Revolving Steam Shovel, high lift. Shop No. 4307. Mounted on caterpillars; ¾-yard dipper.

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One 4"x10"; One 5"x10"; Two 8"x14"; Six 9"x15"; One 10"x26"; One 12"x24"; Two 13"x30"; Two 16"x30"; One 19"x36"; One 24"x36".

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1	75	G. E., form K, 2300 v.....	1800
2	75	G. E., type I, form M, slip ring.....	860
1	75	Fairbanks-Morse, type BV, slip ring...	600
1	75	G. E., form K.....	600
1	75	Westinghouse, type CW, slip ring.....	435
1	100	Westinghouse, type CS.....	870
1	100	Allis-Chalmers, slip ring, 2200 v.....	865
2	100	Westinghouse, type CW, slip ring.....	350
1	200	G. E., form M slip ring.....	514
1	200	Westinghouse CW slip ring.....	500
1	225	Gen. Elec. form M slip ring.....	600
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1	250	Westinghouse, type C.....	850
1	250	Fairbanks-Morse, type HV, slip ring...	800
2	250	G. E., type I, form M, slip ring.....	385
1	300	G. E., type I, form M, slip ring....	1200

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Three No. 1, Two No. 1½ and One No. 2 Sturtevant Rotary Fine Crushers.

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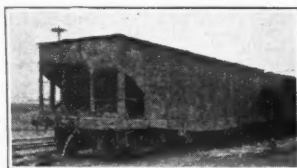
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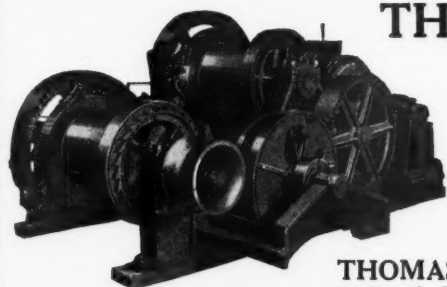
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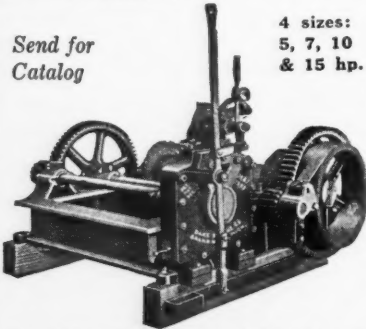
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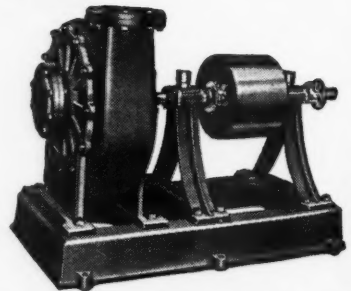


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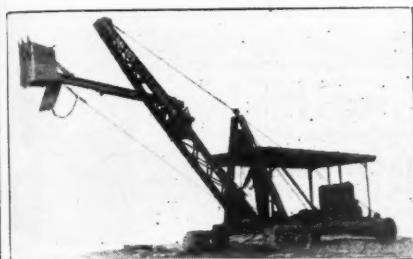


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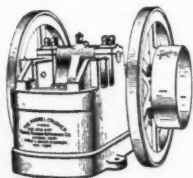
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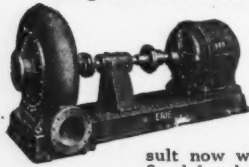
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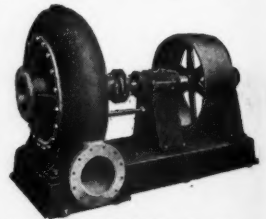
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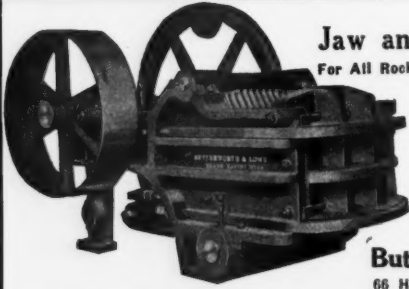


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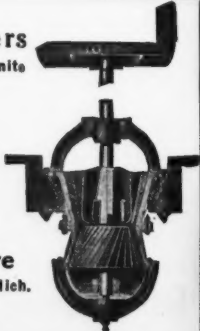
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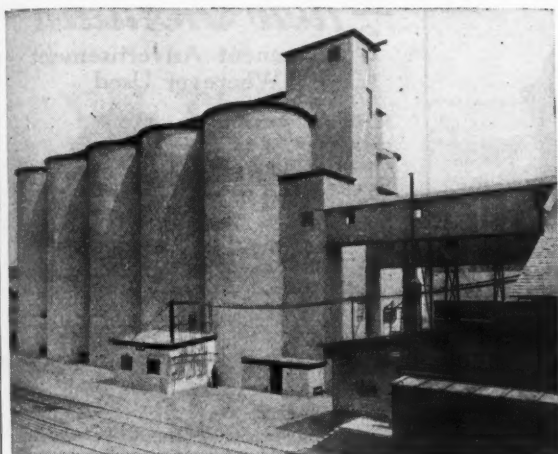
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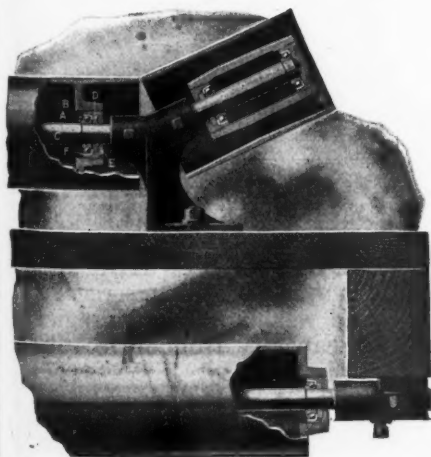
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Designers and
Builders of
**Cement Storage
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Machinery
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*Designs
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Furnished
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Burrell Engineering & Construction Co.
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SAVE POWER!



Conweigh Ball Bearing idlers will save power by reducing Idler friction to minimum because of their correct design and construction.

The Conweigh Ball Bearing Troughing and Return Idlers give easy access for lubrication, and being made of hardened steel with "Conweigh" Ball Bearings reduces Idler resistance and decreases power consumption. Made in all sizes.

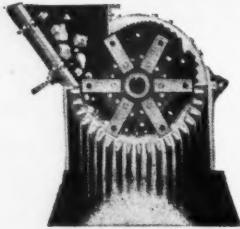
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THE CONVEYING WEIGHER COMPANY

90 West Street

ENGINEER & CONTRACTOR

New York



The GRUENDLER Crusher and Pulverizer

Will Help You Cash in on Im-
mediate Fertilizer Business

To the one who is awake to the immediate opportunity open to the owner of a GRUENDLER CRUSHER and PULVERIZER—that one will profit surely.

The necessity for fertilizing is realized and thought of by every living farmer the country over at this time of year.

Gruendler performance is universally known, being as near perfect as human ingenuity and engineering skill can make it—covering a period of 35 years.

The common sense swing hammer principle reduces over sized rock easily to a 20-screen agricultural limestone. By a simple adjustment the Gruendler crushes 95% of the material which passes a 10-mesh screen and 45% which passes a 100-mesh screen.

One Gruendler Swing hammer crusher has replaced as many as five ball mills, for one of our customers. Many such stories can be furnished showing savings running up into thousands of dollars annually.

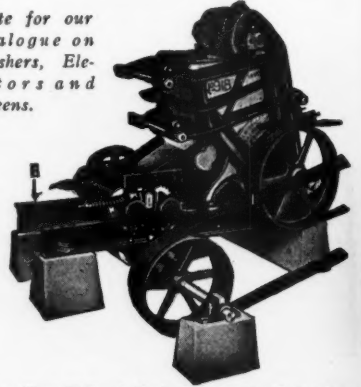
Gruendler Engineers are ready at any time to help solve your crushing and pulverizing problems, without obligation. Write for free bulletins—also ask about our 30-day free trial offer.

Gruendler Patent Crusher & Pulverizer Co.

908 N. Main St.
St. Louis, Missouri

=New Holland= Permanent Advertisement Wherever Used

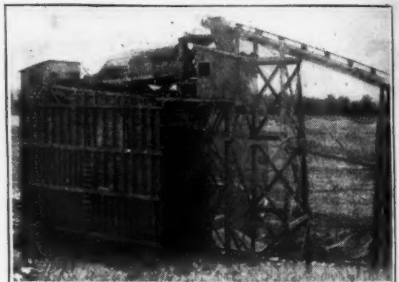
Write for our
catalogue on
Crushers, Ele-
vators and
Screens.



The New Holland Rock Crusher is designed to crush all kinds of quarried rock or surface stone into any size from road ballast down to 3/4-inch grade among which there is a large portion very fine and some dust.

Made of the best grade of semi-steel, with big capacity, is this powerful hard crushing machine. Five sizes to select from.

New Holland Machine Co.
Franklin Street, New Holland, Pa., U. S. A.



**ECONOMY, SIMPLICITY
AND DURABILITY** are
the chief characteristics of
RELIANCE equipment.
Complete crushing, screening
and washing plants ranging
in capacity from 50 to 1500
Tons Per Day.

Send for Catalogue and Prices

Universal Road Machinery Co.
KINGSTON, N. Y.

Boston—141 Milk St. New York—114 Liberty St.
Chicago—Peoples Gas Bldg.

RELIANCE—, "Best in the Long Run"

"DOMESTIC"

ON THE JOB



With a "Domestic" on the job, your worries are over for it is so designed as to give maximum results at a minimum upkeep. This force pump unit will meet the demand for a pump of large capacity that will handle water containing mud, sand, clay, etc.

The Domestic Double Acting Trench Force Pumps with its large capacity and small bulk and light weight will discharge to higher levels or through long horizontal pipe or hose lines without difficulty. Write for further information together with your pumping problems and we will help you solve them.

**DOMESTIC
ENGINE & PUMP CO.**
Manufacturers
SHIPPENSBURG, PENNA.



Heavy Pipe Qualities in a Light Pipe

THAT tells the story of Taylor Spiral Riveted Pipe. It has the full strength of the metal plus the added strength of the riveted seam. It is strong enough for any quarry service; light enough for easy handling. Each length is fitted with unbreakable forged steel flanges. Ask for elaborate 88 page production book. It tells the complete story of Taylor products.

*American Spiral
Pipe Works*

BOX 485

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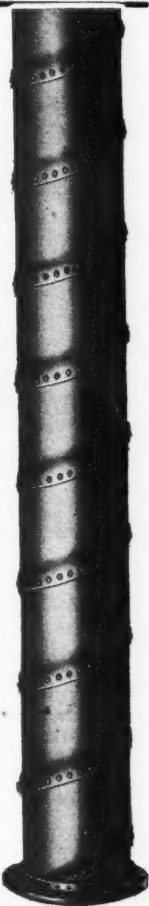
50 CHURCH ST.

*Also manufacturers of
Taylor Forge Welded Pipe
and fittings.*

TAYLOR

Spiral Riveted PIPE

PQ9-11-RTG



BIGGER AND BETTER

The New 1925 Model

NELSON FORDSON LOADER



"The Standard of Service"

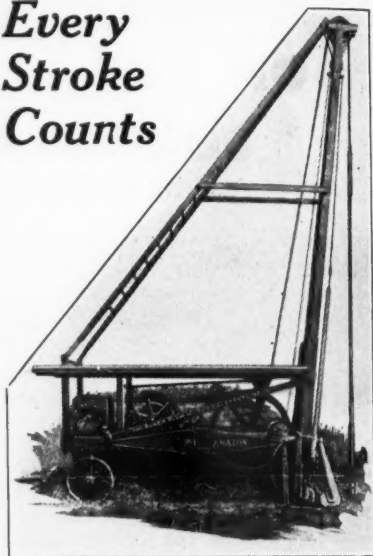
Sixty to eighty yards an hour.
Self feeding without hand labor.
Slow crowding keeps buckets full.
Strong, well designed frames.
Saves labor and truck time.
All work in plain sight of operator.
Swivel spout ten feet high.
Side or end loading of big trucks
Digs its own road into the pile.

*Write for Catalog and Prices, or
Ask your Ford Dealer.*

**N. P. NELSON IRON
WORKS, Inc.**
Passaic, N. J.

Where we lead others follow.

Every Stroke Counts



More Strokes per Minute

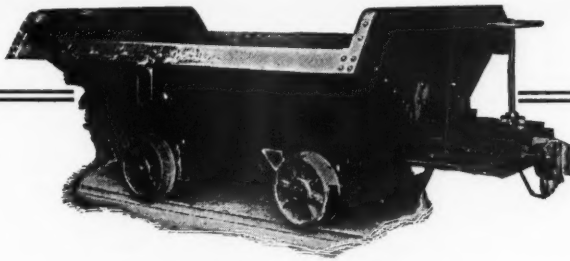
Five to ten more strokes per minute—every stroke a snappy, powerful impact—that's why the Amazon Drill bites its way so rapidly into the rock.

Not only does the Amazon Drill disclose a gratifying ability for swift operation. On points of maintenance, simplicity, and durability its advantages compel serious consideration.

B 126

*Send for an Amazon catalogue.
It contains complete details.*

**THE
BURCH PLOW WORKS
COMPANY**
CRESTLINE, OHIO



QUARRY CARS THAT ENDURE

Under Most Abusive Loading Conditions

ATLAS CARS are designed to reduce haulage costs and last longer

"They do both—Why not Investigate"

Engineering Service Especially Developed in Quarry Car Design

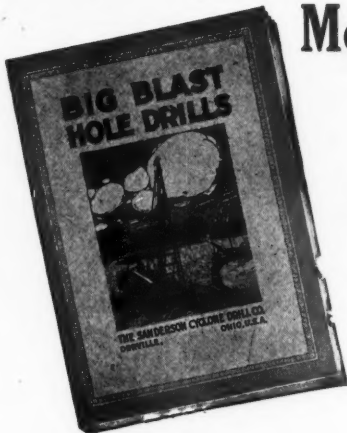
THE ATLAS CAR & MFG. CO.

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Quarry Cars, Rocker and Gable Bottom Cars, Special Cars of All Kinds

For Quarrymen Who Want to Know More About Drilling



A NEW 120-page edition of our book "Big Blast Hole Drills" is ready.

Half of this book consists of information on the drilling qualities of different rocks, methods of operation and cost data on drilling and blasting.

The balance of the book describes in detail the three sizes of Cyclone Big Blast Hole Drills, one of which will handle practically any quarry's drilling.

Write for a copy.

The Sanderson - Cyclone Drill Co.

Orrville, Ohio

EASTERN and EXPORT OFFICE
30 CHURCH ST., NEW YORK

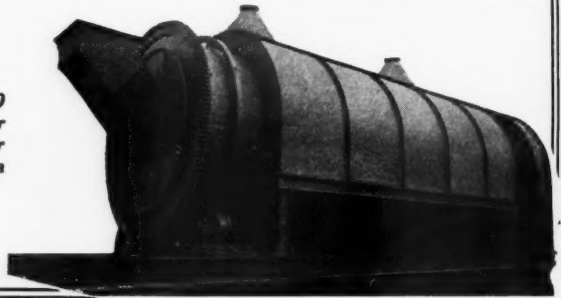
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The Continuous Cement Bag Cleaner presents an economical and labor saving method of reclaiming cement from bags. The process is simple and convenient. Approximately one pound of cement per bag is reclaimed—more than enough to make the operation profitable.

A number of the largest and most up to date mills in the country are now using this Bag Cleaner with the most gratifying results. Write for prices and information.

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Works: Nazareth, Pa. New York: 106 Front St.

*Capacity from 2000
to 10,000 bags per
hour. Arranged for
either gear or chain
drive.*



Clean Materials Are Worth More



The Demand of the Market

Is increasingly for clean, high grade materials. By using the Perfect Classifier you will be able to produce clean materials at all times. This machine will wash sand, gravel, limestone, phosphate, coal, ore, etc., removing all filth or foreign matters, leaving the material thoroughly cleaned. The cost is soon absorbed by the better prices your product will bring.

A request will bring full information.

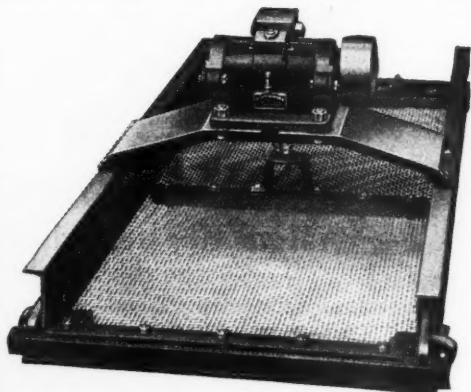
PERFECT CLASSIFIER COMPANY

Manufacturers of ORE CLASSIFIER Machinery

105 FIRST AVE., South

NASHVILLE, TENN.

Leahy NO-BLIND Vibrating SCREENS



Will Screen
Anything—
Wet or Dry

VERY LOW POWER
CONSUMPTION
½ H. P.

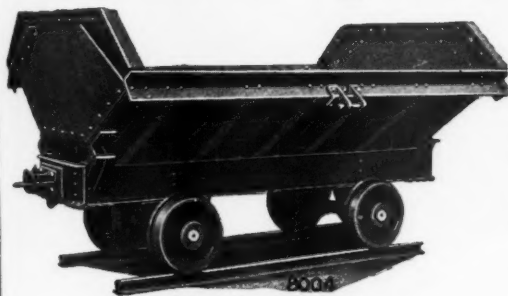
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635 High Street
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Type 8004
BULLETIN 21

shows other types of quarry cars. Sent on request.

"Quarry Car Practice"

Published Every Now and Then

Simplicity

Simplicity in design when not backed by sound engineering principles has a direct hurtful effect on performance and cost of operation. Simplicity can be folly and folly is failure to grasp the requirements of successful service.

**Easton Car &
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Kansas City, Mo. and Easton, Pa.

Offices

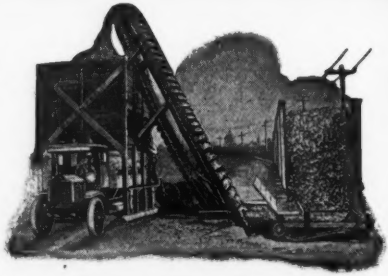
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EASTON CARS

FOR EVERY PIT MINE & QUARRY

Here's What We GUARANTEE

When equipped with proper size feeder, the SUNBURY Automatic Unloader



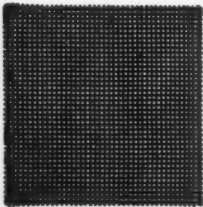
Will load or unload a *The* **SUNBURY**
50-ton car in 90 minutes! **Automatic Unloader**

And one man can handle it. The first cost is reasonable and its return from the standpoint of its being able to substantially increase your profits makes it a very profitable investment.

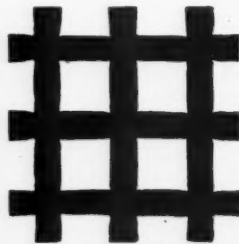
Its automatic feature is important and will commend it to you. It is simple in construction, strongly built and economical in operation.

We will be pleased to send you an illustrated descriptive circular.

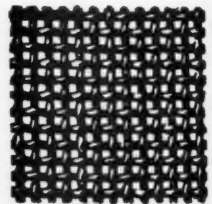
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SUNBURY, OHIO



40 Mesh; .0135 Wire



2 1/2 Mesh; .105 Wire



12 Mesh; .047 Wire

SERVICE! is the one thought behind every operation in the manufacture of—

“CLEVELAND” Double-Crimped Wire Cloth

Uniform fineness and long service will be assured by its use in screening **SAND, GRAVEL, CRUSHED STONE AND CEMENT.**

Large stock always on hand; special mesh manufactured to suit requirements at right prices.

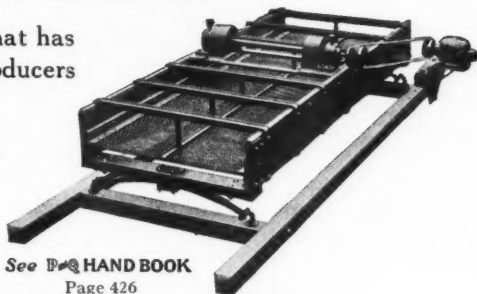
THE CLEVELAND WIRE CLOTH & MFG. CO.
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UNIVERSAL VIBRATORS

for the **HIGHEST SCREENING EFFICIENCY**
at the **LOWEST COST**

A tried and proven unit that has won the approval of producers everywhere.

The large percentage of **REPEAT ORDERS** we are constantly receiving —tells the story.



See **P&Q HAND BOOK**
Page 426

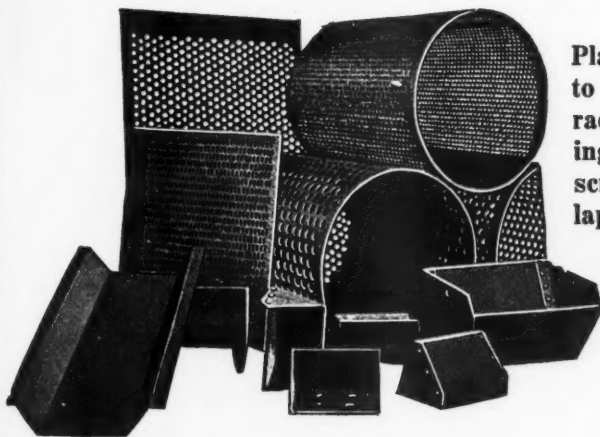
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Vibrator will be mailed to you promptly.*

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RACINE -- WISCONSIN

Perforated Metal Screens

FOR STONE, SAND, GRAVEL, ETC.



Plates flat; rolled to diameter or radius for revolving and conical screens butted or lap joints.

Elevator Buckets

in all styles
and sizes

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DOUBLE LOG WASHERS

For washing ores, phosphate, rock, gravel, etc., eliminating every trace of clay or other adhering material.

CYLINDER WASHERS

For eliminating foreign material when not embedded in clay.

ELEVATORS

All steel slow moving elevators—no sprocket chains to cause trouble.

SINGLE ROLL CRUSHER

For primary and secondary crushing of any material not harder than hard limestone and dolomite, and not exceptionally high in silica.

Special machinery made from specifications and drawings to suit the requirements of customers.

Write for Detailed Information.

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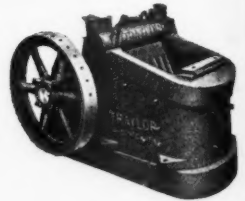
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Bulldog Jaw Crushers

The design of the Traylor Bulldog Jaw Crusher eliminates most troubles because of the following features:

- Simple Pitman of maximum strength
- Frictionless three-bearing toggle system
- Self-aligning Pitman shaft bearings
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- Easy accessibility to all moving parts



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SALT LAKE CITY, 100 W. 2nd South St.

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International Machy. Co., Santiago, Chile.

W. R. Grace & Co., Lima, Peru.

International Machy. Co., Rio de Janeiro, Brazil.

British & Foreign Machy. Co., London.

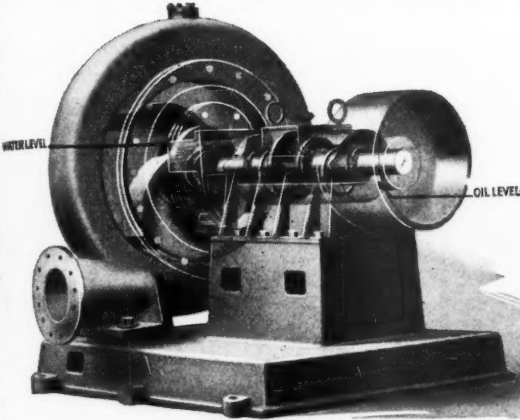
Fraser & Chalmers (S. A.), Ltd., Johannesburg, S. A.

S. Oppenheim & Co., Ltd., Rangoon, India.

General Electric (S. A.), Buenos Aires.

European Works: Ghent, Belgium, Usines Carels Freres.

Tampa Dredging Pumps Are The Best



The curves of our runner flights are shaped right.

Our square shaped shell avoids spiral motion in discharge.

Our water seal makes air leaks impossible.

Our oiling system eliminates lubricating troubles.

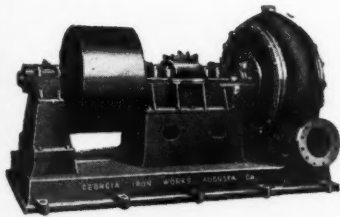
Our yardage production is unequalled.

We manufacture

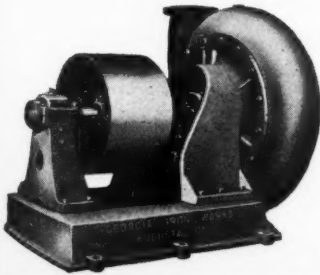
4", 6", 8", 10", 12" and 15"
either direct connected to motor or belt driven

TAMPA SHIPBUILDING & ENGINEERING CO.
TAMPA, FLORIDA

WRITE FOR PRICES, DESCRIPTION and OUTLINE BLUE PRINT



Heavy duty belt driven sand and dredging pump built in 8", 10", and 12" sizes.



Overhanging type belt driven sand and dredging pump. Built in 6" and 8" sizes.

SAND PUMPS

The accompanying cuts show two very popular types of belt driven units. These pumps are also built with bases for direct connection to motor.

Send for illustrated catalog showing our complete line of this equipment including flanged pipe fittings and hydraulic guns.

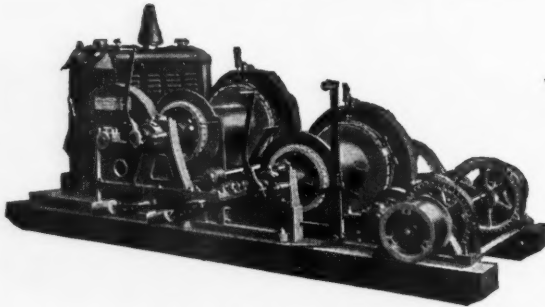
GEORGIA IRON WORKS
AUGUSTA, GA.

Established 1891

LIDGERWOOD HOISTS

Steam—Electric—Gasoline

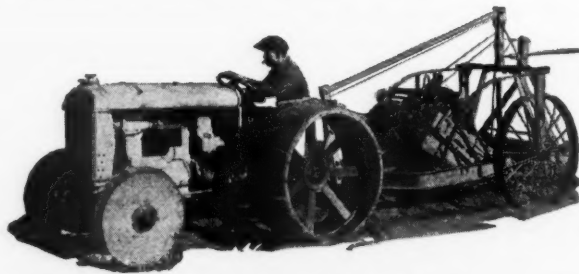
Built in Types for Every Contractor's Service



They do their
work to your
Profit

LIDGERWOOD MFG. CO., 96 Liberty St., New York

Chicago; Pittsburgh; Philadelphia; Detroit; Los Angeles; Seattle; Tacoma; Portland, Ore.; Brown-Marx Bldg., Birmingham, Ala. Sales Agents: Norman B. Livermore, San Francisco; Woodward, Wight & Co., New Orleans, La.; John D. Westbrook, Inc., Norfolk, Va.; Canadian Allis-Chalmers, Ltd., Toronto. Foreign Offices: Sao Paulo, Brazil; Rio de Janeiro, Brazil; London, Eng.



**Would You Like To Strip More Earth
Per Day At Less Cost Per Cubic Yard?**

Every Pit & Quarry operator would yet hundreds have failed to investigate the dirt moving ability of The Miami-Fordson (one-man) Scraper.

If you are one of them better take the time right now to write and get full details of this dirt mover that is moving 100 cubic yards and more of earth per day, on a four hundred round trip haul, for 15c and less per cubic yard.

These figures are taken from your field. For actual cost data and detailed information, WRITE TODAY to—

THE MIAMI TRAILER SCRAPER CO.

615 S. Clay Street

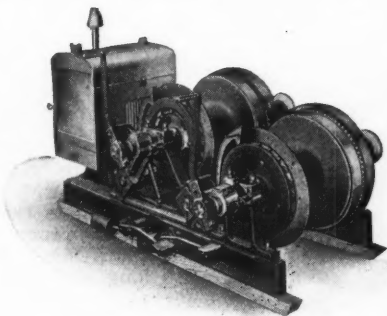
Troy, Ohio

MIAMI *FORDSON*
one man power **SCRAPER**

Reg. U. S. Pat. Off.

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We build a Standard Line of Gasoline Hoists which are noted for their Reliability and Strength. They are built with Single, Double or Triple Drums and with or without Boom Swinging Attachment. These Hoists are built in six sizes, with a capacity of 425 to 5000 pounds on a single line.



Write for Bulletins Nos. 262, 269 and 270.

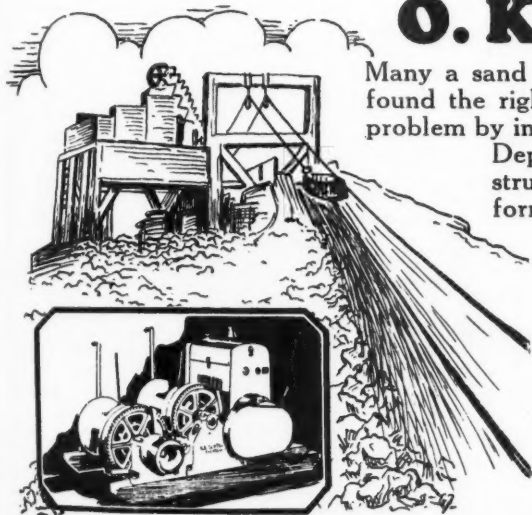
ORR & SEMBOWER, Inc.
READING, PENNA.

50 Church St.
NEW YORK CITY

Established 1885

208 N. Clinton St.
CHICAGO, ILLINOIS

Solve Your Hoisting Problem With an **O. K. HOIST!**



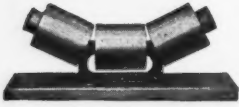
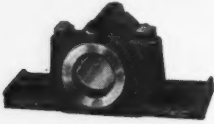
Many a sand and gravel operator has found the right answer to his hoisting problem by installing an O. K. Hoist.

Dependability, sturdy construction and consistent performance, light weight and easy portability, are O. K. qualities, and the qualities you want in your hoist. The O. K. HOIST stands up under hard service.

Easily adjusted or repaired. Write for full information.

O. K. CLUTCH & MACHINERY CO.

BOX 305, COLUMBIA, PA.

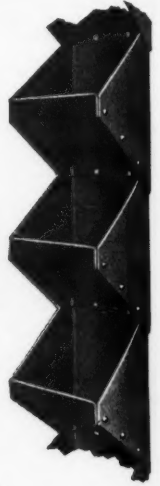


CALDWELL VALUE

THE real worth—or value—of an article is predetermined by the ideals of the makers.

Users of Caldwell products have never questioned the presence of superior value (quality) in this equipment. Once used they know this value for what it is. Self interest prompts them to continue specifying Caldwell products over long spans of years.

If you need elevating, conveying or transmission machinery promptly, address Caldwell or the nearest Link-Belt office.

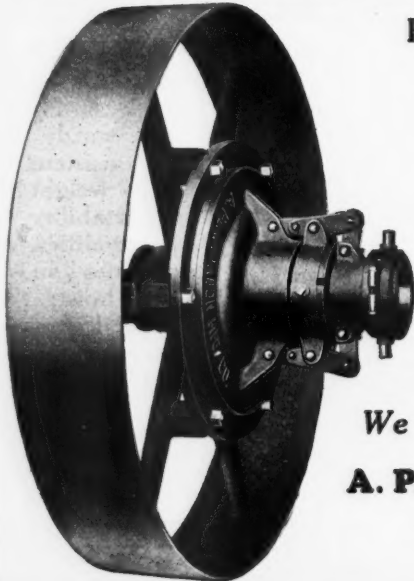


H. W. CALDWELL & SON CO.
LINK-BELT COMPANY, OWNER

Chicago, 1700 S. Western Ave.; Dallas, Texas, 819 Main St.; New York, 2676 Woolworth Bldg.

CALDWELL

IMPROVED PLAMONDON



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HEAVY WORKING PARTS

Now Made of Steel.

DEPENDABLE GEARS

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STEEL or CAST-IRON

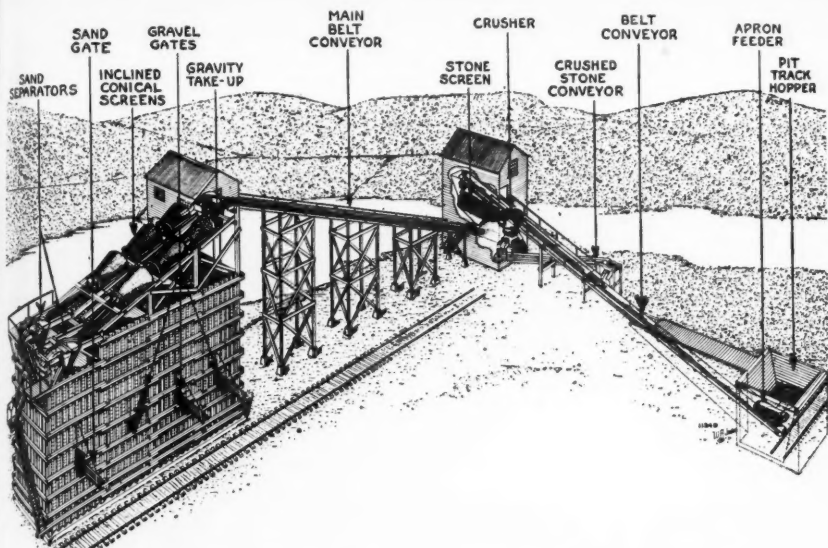
GENERAL MACHINE REPAIRS

PATTERN SHOP—FOUNDRY

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CHICAGO



Link-Belt Profit Earning Sand and Gravel Washing Plants

FROM stripping the overburden with Link-Belt Crane, to the delivery of properly sized and thoroughly washed sand and gravel, through sand and gravel gates to the cars for shipment, Link-Belt equipment efficiently performs every operation.

Each installation is designed and built to fit the individual conditions and requirements.

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Our engineers stand ready to help you solve your sand and gravel handling problems. Send for our new Book No. 540, just off the press.

LINK-BELT COMPANY

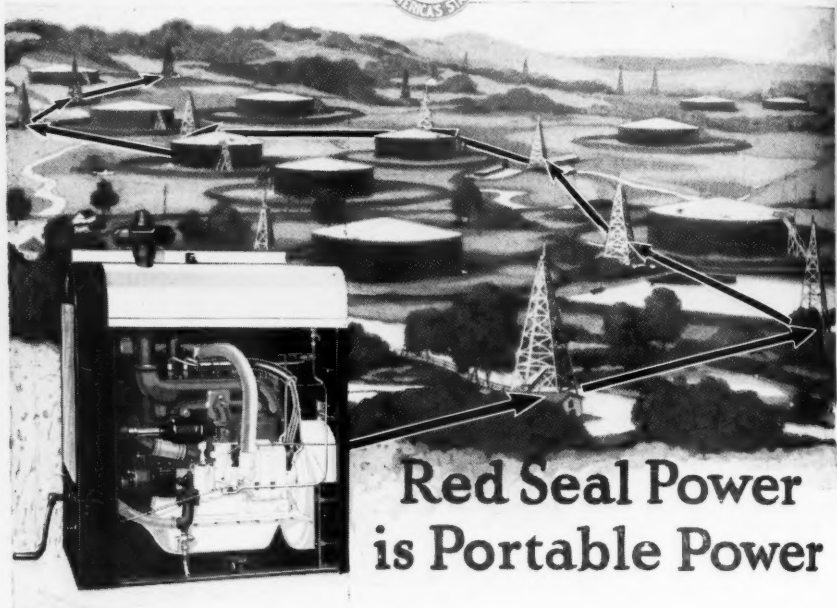
Leading manufacturers of Elevating, Conveying and Power Transmission Machinery
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2316
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RED SEAL High Speed Multi-cylinder Motors have added new advantages to the well recognized portability of the gasoline motor for industrial power.

Low weight per horsepower, as well as low fuel consumption for the weight, form the basis of these Red Seal Motor advantages.

Readily moved from job to job and from point to point on the job, a Red Seal Motor combines the advantages of its own portability with the ease of transporting its fuel supply.

Long and serious study of industrial requirements were made by Continental to add to the already unlimited fund of knowledge accumulated in nearly 25 years of gasoline motor experience.

Continental then applied its highest technical skill to the design and construction of power plants to meet every industrial condition. The results are Red Seal Industrial Motors.

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CONTINENTAL MOTORS CORPORATION

Offices: Detroit, Mich., U. S. A. Factories: Detroit and Muskegon

Continental Motors